VOL. 24, No. 5 MAY, 1947

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1502 Foshay Tower, 821 Marquette Ave., Minneapolis 2, Minn.

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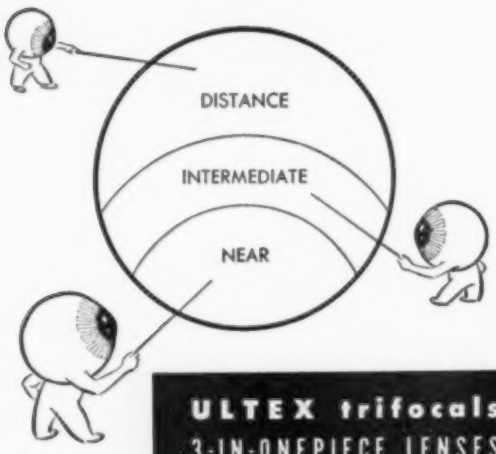

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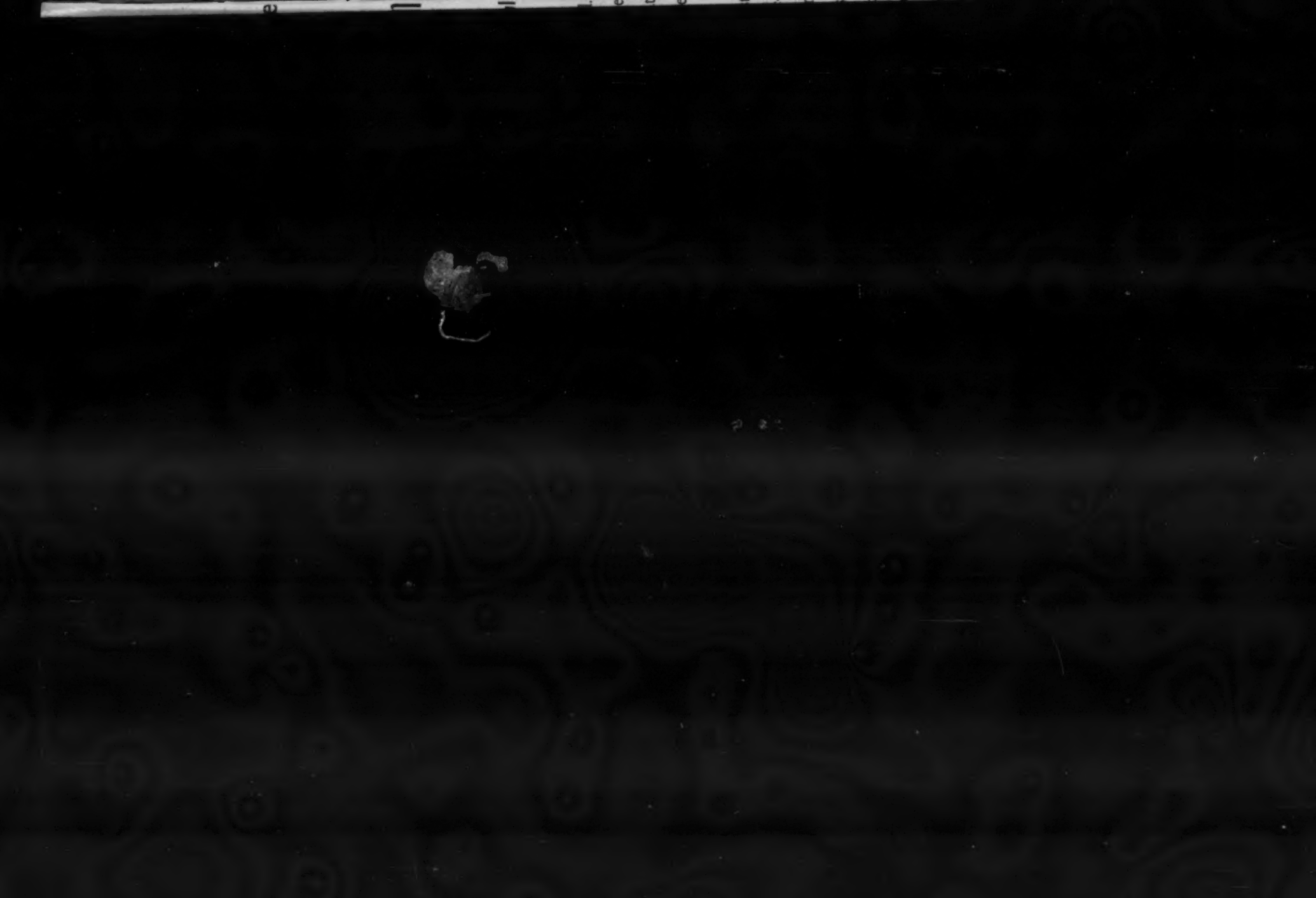

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Publication Office: 1502 Foshay Tower, 821 Marquette Ave., Minneapolis 2, Minn.

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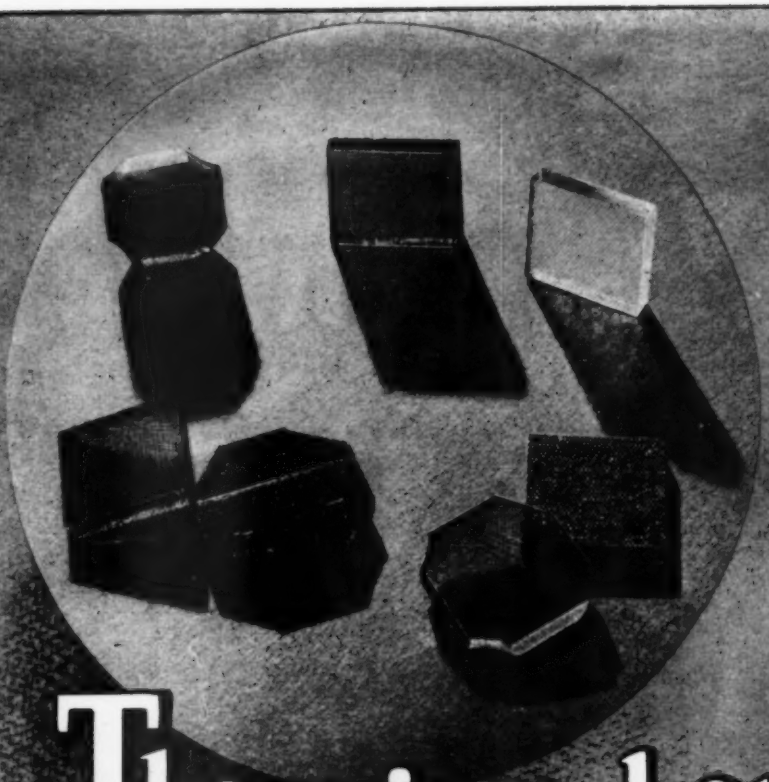

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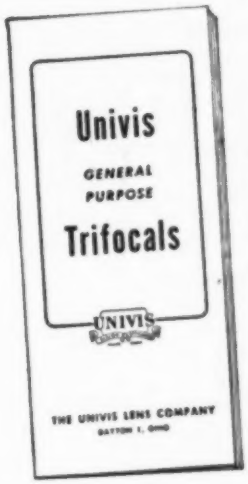

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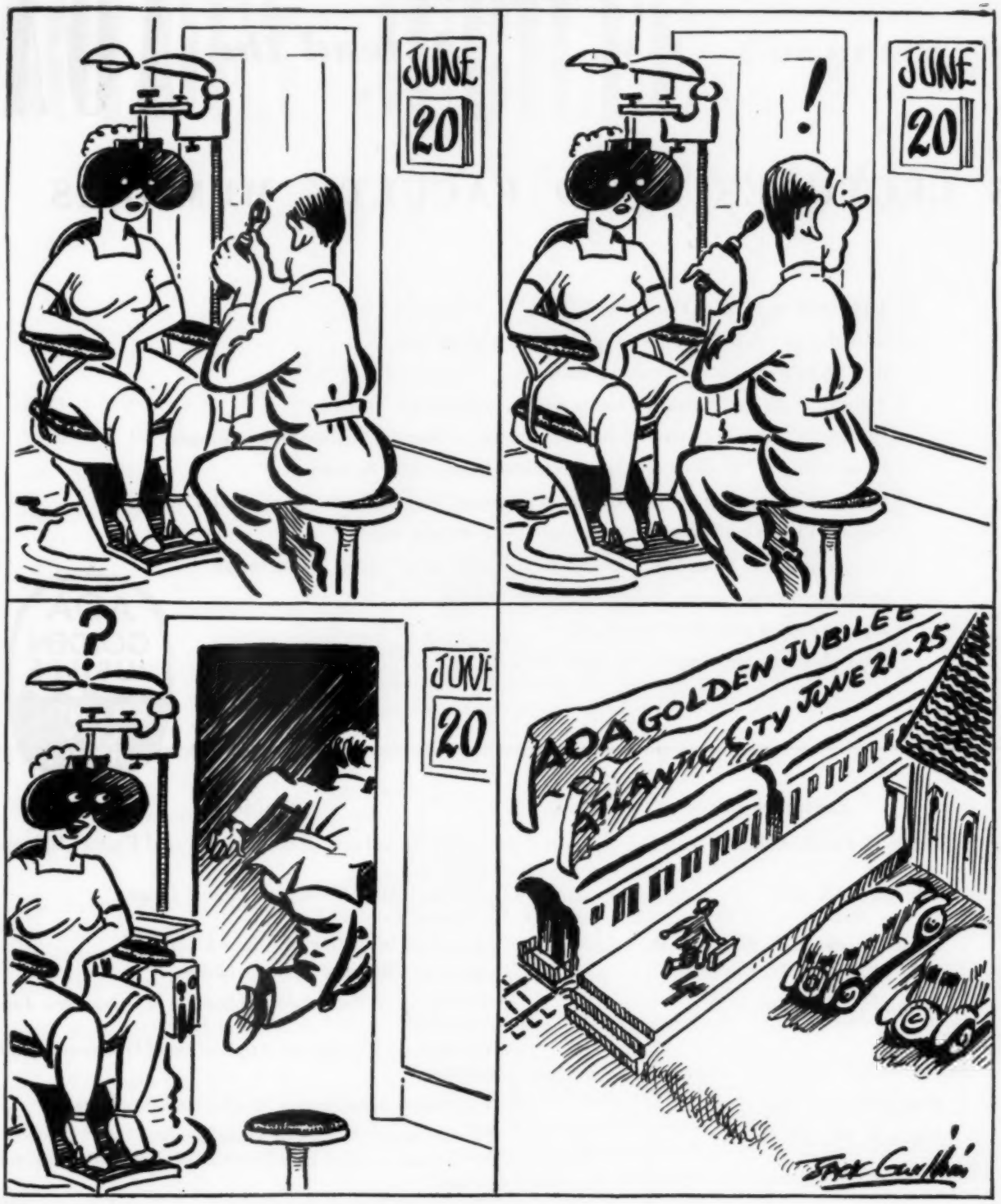

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John C. Neill, O.D.	1	"Introduction to Fitting of Contact Lenses."
	4	"Fitting of Contact Lenses."
Jacob Nevyas, A.B., A.M., Ph.D.	1	"Chemistry in Fitting of Contact Lenses."
Fred W. Sinn, O.D.	1	"Optics in Fitting of Contact Lenses."
Irving P. Filderman, O.D.	1	"Statement of Tennessee Application of Optometric Jurisprudence."
	1	"Discussion of Tennessee Application of Optometric Jurisprudence."
Foster Namias, O.D., F.D.S.F.	2	"The Proper Handling of Multi-Focal Problems."
Glenn A. Fry, Ph.D.	1	"Psychological Factors in Visual Acuity."
	1	"Measurement and Specification of Visual Acuity with Glasses."
	1	"Measurement and Specification of Visual Acuity without Glasses."
	1	"Visibility of Blurred Borders."
G. L. Walls, D.Sc.	2	"Color Vision—Normal and Abnormal."

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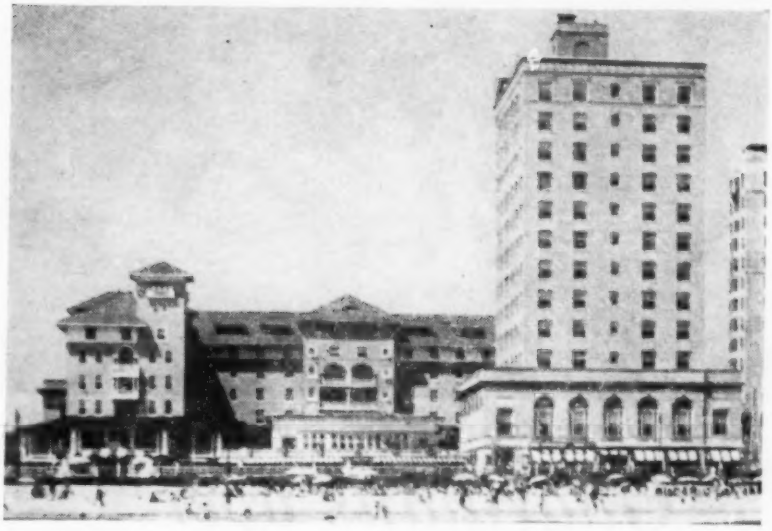

Lecturers	Lecture Periods	Subjects
F. M. Whitsell, M.D.	1	"Fundus Pathology and its Optometric Significance."
	1	"Glaucoma—Newer Aspects of its Pathogenesis."
O. G. Rybachok, B.S., M.A.	2	"Applied Neurology in Optometry."
	1	"Ocular Anatomy in Fitting of Contact Lenses."
Harold Haynes, O.D.	3	"Projection Kaleidoscope in Visual Training."
G. A. Mac Elree, O.D.	1	"Ocular Pathology and Therapeutics in Fitting of Contact Lenses."
H. G. Noyes, A.B., M.D.	2	"Refractive Changes Related to Eye and General Pathology."
Julius F. Neumueller, B.S., O.D.	2	"The Correlation of Optometric Binocular Measurements for Refractive Diagnosis."
Harold Simmerman, O.D.	2	"Neural Anatomy in Visual Fields."
Carl F. Shepard, O.D.	3	"Practical Application of Clinical Optometric Research."
Louis Wekstein, Ph.D.	3	"Implications of Abnormal Psychology in Clinical Optometry."
E. W. Bechtold, B.S.	2	"Image Formation in the Eye—A Consideration of the Departures from Point to Point Correspondence."
J. D. Kratz, A.B., O.D.	2	"Neural Anatomy in Extra-Ocular Muscle Disfunction."

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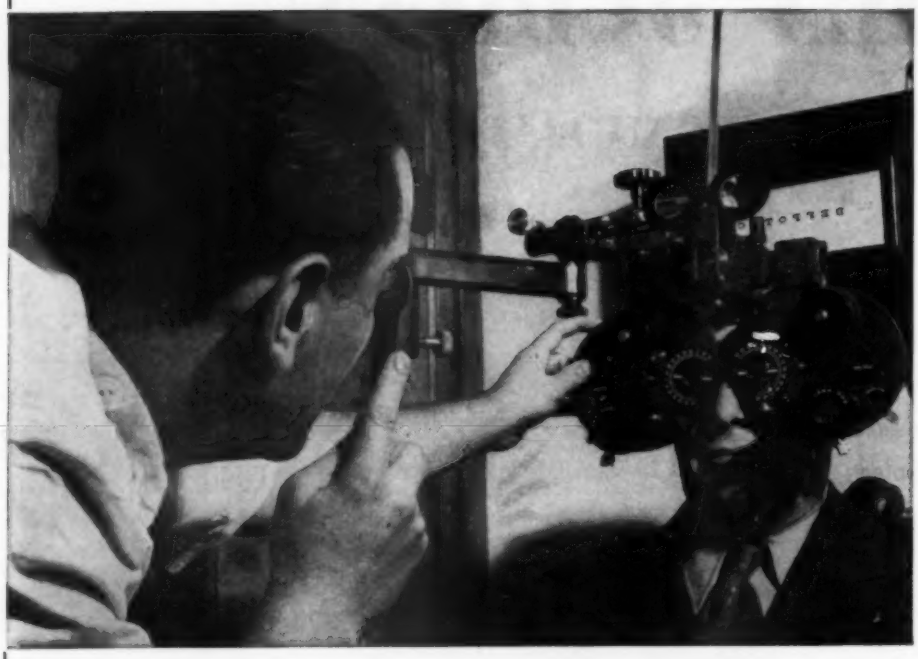

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Vol. 24 MAY, 1947 No. 5

THE OPTOMETRIC IMPRESSION TECHNIQUE IN THE FITTING OF CONTACT LENSES*

Eugene Freeman† and Milton Freeman‡
Chicago, Illinois

FOREWORD

In the early days of contact lens work, the pioneers in the field had to be their own teachers. The literature available was scanty and inadequate, and the techniques which have become familiar today had not been developed.

Today the student who wishes to engage in contact lens practice has his path well smoothed for him. Various intensive short courses in technique are available to him—and while of course he cannot become an experienced practitioner by the time he completes his course, he can nevertheless learn enough to be qualified to engage in the work as a beginner.

It is the primary purpose of the authors to make freely available to the earnest student of contact lens practice a comprehensive statement of our concepts and techniques of practice. It is our hope that this material will prove useful not only to those who are already engaged in contact lens work as experienced practitioners, or as students in a formal course designed to give them the training needed for them to enter the field, but to the general practitioner of optometry as well, even though he does not propose to actually do contact lens work himself.

As an optometrist, of course, the general practitioner is already qualified legally to carry on a contact lens practice without evidence of special training in the field. It is conceivable that an optometrist with a natural bent for contact lens work could learn enough from books to

*Submitted on March 1, 1947, for publication in the May, 1947, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist, Chairman of the Section on Contact Lenses of the American Academy of Optometry, Fellow, American Academy of Optometry, President, Freeman Laboratories, Inc., Director, Freeman Contact Lens Clinic.

‡Executive Vice President, Freeman Laboratories, Inc., Co-Director, Freeman Contact Lens Clinic.

do the work without formal training. The average practitioner, however, would be rash to try. As a matter of fact, even if he does no more than refer his own cases to a colleague who does this work, it would be well worth his time to take a short intensive course in contact lens techniques. As the general practitioner becomes more intimately acquainted with the technical aspects of contact lens practice, his own effectiveness in screening and diagnosing the needs of his patients for the services of the contact lens specialist, and his effectiveness in cooperating with the specialist concerning the after-care needed by his own patients, can be increased to the point where he can delegate the technical aspects of the work to the specialist who would serve in the role of a technical consultant, while the general practitioner remained in charge of and responsible for the case.

I. BASIC CONCEPTS OF FITTING PROCEDURES

The custom molded contact lenses designed and manufactured by the authors are the outcome of research and clinical investigations which have been carried on by the authors since 1934. The fitting techniques and lens designs available from other sources were tested in the proving ground of the author's private practice. Both the molded and ready-made lenses were found to require an inordinate amount of laboratory re-work on the part of the doctor, who had to virtually re-design and re-shape the lenses himself.

It was found that this re-work was very much more difficult to do on a ready-made lens, as even the most delicate changes in design or thickness or contour were just as likely to spoil the lens as to improve it. Consummate skill and an inordinate number of visits were required to complete the typical case where ready-made lenses were used as a starting point—and the results at best invariably fell far short, cosmetically and optically, of those obtained concurrently by the impression technique. This was especially true of those cases where the ready-made lenses were eventually rejected and replaced with custom molded lenses, in a much shorter time and with very much better results.

Comparative studies convinced us that the best starting point was a good pair of eye impressions; and our research became focused on the problems of (a) supplying and improving the methods of making eye impressions; (b) improving the design and method of manufacturing a molded lens, so that for lenses made from good impressions, any re-work required could be done by the average doctor in one visit; and (c) simplifying and clarifying the principles of fitting procedure and

re-work technique so that the average doctor could work on a lens without spoiling it.

This research, which was originally undertaken in order to improve the quality of the work done in our private practice, eventually led to the establishment of our clinic for training professional practitioners in the fitting of contact lenses, and our own laboratory for the incorporation of our improvements in the design of contact lenses.

Our basic fitting procedures and concepts include the following:

Tight Areas:

A basic concept of lens design contributed by the authors is that "tight areas" are significant only in the primary position, and should be disregarded when they are produced only in rotated positions of the eyes.

Impressions without Anesthesia:

Equally significant is the Freeman simplification of the technique for making eye impressions, and the elimination of the use of anesthesia. Over two hundred doctors who have been trained in our clinic use this technique exclusively, and the number of patients who have been fitted by this technique is sufficiently large to establish it as a standard routine.

Improved Molding Shells:

The impression shells designed by the authors are so shaped as to minimize lid pressure during molding, and to allow for free flow of impression material after insertion of the shell. The shell is decentered and designed like a contact lens, so that a better ratio of the superior, temporal, inferior and nasal quadrants of the impression are obtained. The countersunk perforations in the shell minimize the possibility of the impression being pulled away from the shell, and the flat tapered handle affords a firm grip. The shells are made in three basic sizes, which take care of all but exceptional cases. For these, special sizes are available.

Improved Casting Technique:

Our research has shown that the accuracy of the stone positives made by the doctor can be markedly increased by a simple refinement in casting procedure. This refinement, which is described below, gives the doctor a cast with clean cut, sharply delimited, peripheral boundaries, and accurate curves; and eliminates much of the need for guessing and improvising when the lens is designed by the laboratory.

Minimum Re-work Required:

Fallacies.

We believe that much of what has been taught about "modifying"

a lens is fallacious. A contact lens which produces no physical discomfort, no optical difficulties, and no cosmetic defects can be considered a good fit. If a lens fits so badly as to require a heated forceps to bend it to a better shape, our policy is to discard the lens and make another one. We believe it is equally futile for the average doctor to attempt to do any of the following:

To remove a superior corneal limbus touch by relieving a so-called "tight area" on the inferior flange.

To shift the optical center of the lens to the proper position by loosening or tightening the lens.

To remedy a badly spinning or rotating lens.

To remedy a lens that shows alternate pressure bands and open areas throughout the central scleral zone and loses fluid.

To increase the bearing surface on a lens that has a narrow peripheral scleral bearing and consequent excessive dynamic lag.

Our fitting concepts are based on the fundamental principle that *poorly fitting lenses should be re-made by the laboratory*, rather than the doctor. If the doctor is in doubt as to whether or not the lenses can be re-made from the old casts or whether new impressions need to be made, he can fill out the fitting chart, mark the lenses and let the laboratory decide.

We believe that the following three simple types of adjustments are all that the doctor should attempt to do himself; although he is welcome to let the laboratory perform his work for him if he prefers. 1. Reduction of contour size. 2. Closing small and easily manageable open areas. 3. Relieving very slight tight areas (other than limbal).

Our laboratory prefers to increase limbus clearance, where needed, for the doctor, and to make all minor adjustments which involve redesigning the lens.

Our policy is based on the experience which has taught us that it is far simpler and far more satisfactory for the doctor to work with well designed lenses made from good impressions, rather than to spend the time required to re-design and re-make poorly fitting lenses.

II. OFFICE PROCEDURE AND OUTLINE OF ROUTINE

The first requisite of success in contact lens work is that the patient must have implicit confidence in his doctor. In order to gain and keep the patient's confidence, the doctor must continuously "sell" his personality and technical ability to his patient throughout the entire course of the doctor-patient relationship.

The doctor's salesmanship is, of course, never vocal as such. He can convince the patient of his technical ability only by actual demonstration, and he is judged not only by his results, but by the smoothness and finesse of the technique by which he obtains them. These are factors which the patient can evaluate directly and consciously. In addition to these direct factors, there are others which may be called peripheral factors, which subtly and perhaps subconsciously influence the patient's evaluation of the doctor. Among these are the doctor's reputation, his office, including the location, furnishings, equipment, and atmosphere, and the personality and cultural level of not only the doctor but his receptionist and assistants as well.

It is not our intention to consider here the details of how the optometrist can best control and improve these peripheral factors. We are concerned only with pointing out that they are vital in determining whether a contact lens patient will trust the doctor and cooperate with him, or be afraid of him and be unable or unwilling to cooperate.

In our office routine, we begin with a preliminary consultation which screens out those patients for whom contact lenses are contraindicated and ensures that the patient who is accepted has a proper understanding of the present day limitations on the wearing time of contact lenses. The typical wearing time for contact lenses before fogging sets in is three to five hours. Some patients are able to clear their vision by changing fluid without a rest period. More typically, the patient requires a rest period of from 15 minutes to an hour before clear vision is restored. Occasionally a patient is able to achieve an all-day tolerance for contact lenses without the necessity for making any fluid changes, but this is rare.

For the average practitioner, the typical grounds for contraindications are:

(a) active pathology
(b) uncorrectible pathology
(c) a low order ametropia
(d) inordinate demands on wearing time
(e) extreme fear and nervousness

Factors (b) and (c) are considered only tentative grounds for contraindication of contact lenses and further exploration is required before a final decision is made. The decision about factor (b) (uncorrectible pathology) is reserved until a screening test is made with the aid of a trial contact lens. In some cases, the damage done by otherwise uncorrectible pathology is corrected to a degree with contact lenses which

warrants their prescription. Factor (e) (extreme fear and nervousness) may either not be apparent until the work with the patient is begun and may be so pronounced that the doctor must dismiss the patient, or it may appear to be very formidable at first, and yet the patient may be able to overcome it with the proper encouragement, if the doctor's technique is sufficiently skillful.

The first step following the consultation is to make a complete optometric analysis, if the patient is a new patient, or to bring the records up to date if the patient has been previously under the care of the doctor. The next step is to make eye impressions, which may be done at the same visit. This is considered visit No. 1. At the second visit, the semi-finished lenses (with no optical surfaces as yet) are inserted and checked for fit and comfort. The lenses are marked to indicate locations of optical centers and any areas to be modified or adjusted, if this is found necessary. The patient is then given preliminary training in inserting and removal of his lenses. At the third visit, the lenses are re-marked as before, and any modification or adjustment indicated is completed. The prescription is determined with the aid of a trial lens. The patient then receives additional preliminary training in inserting and removing his lenses. At the fourth visit, the prescription which has been ground into the patient's lenses is tested and refined. The patient is given further instructions. At the fifth visit, the prescription, which may or may not have been further changed, is re-checked, and the patient's technique is checked. He is given instruction concerning wearing lenses, caring for them, determining fluids, and a report sheet.

III. RECOMMENDED PROCEDURE FOR MAKING EYE IMPRESSIONS WITHOUT ANESTHESIA

Eye impressions are made using "Moldite" in the conventional manner, except that anesthesia is not needed or used. No lid retractors are used.

Patient's Position:

The patient is placed in a reclining position, which can easily be obtained by dropping the back of the ophthalmic chair so that it is parallel with the floor. An instrument table or an operating stool is used to support the feet. The patient's head rests on the top of the back of the chair, and the head rest is adjusted to eliminate side to side movement of the head.

Fixation Target and Position of Eyes:

A small square of light is projected on the ceiling for a fixation target. This target is so placed that the cornea of the eye to be molded is

turned slightly down and slightly nasalward. The relative amount of scleral surface which can be seen in the primary position when the lids are pulled away should be about twice as wide temporally, and about one and a half times as wide superiorly as either nasally or inferiorly. The ratio is about 2 temporal, 1-½ superior, 1 nasal, and 1 inferior. This centers the cornea in about the same manner as in a finished lens.

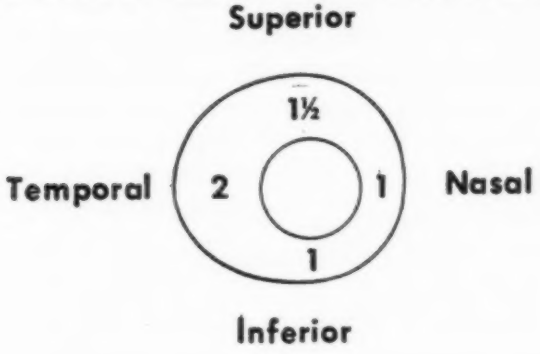

FIG. 1

Cover Test:

If the eye to be molded deviates when it is covered with a card, while the other eye is fixating the target, the position of the deviating eye is controlled by moving the light until the eye, which is seen behind the card, is in the proper molding position when covered. The shift which occurs when the eye is then uncovered is disregarded, as the eye will normally deviate to the pre-determined proper position when it is occluded by the moldite.

Selection of Molding Shell:

The molding shell used should be as large as possible, and good judgment should be exercised by the doctor in selecting the size. The average patient is molded with the author's No. 2 size shell. If either the eyes or the lid openings, or both, are unusually small, the No. 3 shells are used. But if they are unusually large, the No. 1 shell is used. On very rare occasions, especially designed shells, which are proportionately smaller or larger than the regular size, may be required. These can be supplied upon request.

Preparation of Materials:

Before the patient is ushered into the room where the impressions are to be made, all of the preliminary preparations should be completed, in order to avoid increasing the nervousness of the patient, which might result from any delay.

1. Impression powder (Moldite).

Three level ½ teaspoons of Moldite are placed in each of two small rubber mixing bowls. A plastic spatula is placed on top of each bowl. Note: This is adequate for a No. 3 or No. 2 shell. If a No. 1 shell is used, a corresponding increase in water and moldite is needed, e.g., 4 spoons of moldite and 5.6 cc. of water.

2. Distilled water.

4.2 to 4.6 cc. distilled water is placed in each of two cylindrical graduates. A two-ounce dropper bottle is used to hold a clean eye dropper with the aid of which small adjustments in measuring can easily be made.

3. Temperature.

A stirring thermometer (either F. or C.) is used to check the room temperature. If the room temperature falls between 70 to 73 degrees F. or 21 to 22 degrees C., no further temperature control is needed, providing the container in which the distilled water is kept has had time to take the room temperature. If the room temperature is not between these limits, a sink full of water is mixed at either 70 degrees F. or 21 degrees C. (using ice if necessary) and the two graduates, each containing the properly measured amount of water, are placed in the sink and kept there until the moldite is mixed. The exact quantity of water required is determined by mixing a test batch of moldite at the correct temperature when the tube is first opened. There is some variation in different tubes, and it is important to know the quantity of water that will produce the best mixture. Water should not be added while mixing, but if the mixture is unsatisfactory, the entire procedure would be started over, using more water if the previous mixture was too thick and less if it was too thin.

4. White Vaseline in Sterile Tube.

The impression shells are lubricated with the thinnest possible film of white vaseline, on the outer surface only. A touch of vaseline is rubbed between the thumb and forefinger until it apparently has disappeared, and these fingers are then lightly rolled around the outside of the shell so that it is barely lubricated. No vaseline should touch the inside of the shell, nor should any of the holes be plugged up.

5. Band-Aid.

At the time the doctor is placing the moldite into the impression shell, his assistant attaches a small strip of band-aid to the lower lid margin directly below the lashes. While this is being done the patient is

told to fixate upwards in order not to entangle the lashes. When the assistant pulls the lower lid down, he should not pull on the tapes, but should roll the lid down *through* the tape, placing two fingers up to the lid margin as the shell moves up under the upper lid. In this way he keeps his fingers out of the way of the inferior flange of the shell as it is being inserted, but "walks" close enough to the lid margin at the proper time to be able to pull the lower lid free.

6. The further materials needed are:

a. Impression hook, used to free excess moldite from lids after impression has set.

b. Cotton tipped applicators, which are used to remove any excess particles of moldite left in the eye.

c. Warmed buffer fluid, used to moisten the applicators and to irrigate the eyes after impressions are taken.

d. Kleenex, for patient's use.

e. Smelling salts, which are kept out of sight but which should be available if needed.

f. Fluorescein and argon bulb, to check possible corneal abrasions.

g. Chrome plated shell holders, for holding impression shells. (Useful but can be dispensed with).

h. Plastic templates (2) marked with patient's name, to support impression in fixing bath.

i. Two wine glasses filled with fixing bath (made by dissolving 1 tablet of potassium sulphate; 15½ grains, in 100 cc. of tap water).

j. Sharpened red cellophane marking pencil.

k. Watch or clock with second hand.

Mixing and Spatulating Impression Material:

Before the impression material is mixed, the patient is placed in the proper position. The target is adjusted to obtain correct fixation, and the "cover test" is made to ensure that fixation does not change when the eye to be molded is occluded. If the test reveals a deviation, the target is readjusted so that the deviating eye, (as seen behind a card that blocks the target) assumes the desired position when under cover.

The distilled water, which has been measured and cooled, is poured from one graduate into the mixing bowl containing the moldite, care being taken to get every drop. The spatula is held like a pencil, and the moldite is pressed against the side of the bowl until all of the water is absorbed, and all the loose powder is dissolved. The mixing is done

slowly and gently at the start, and continued with accelerated speed and force until twenty seconds have elapsed. The grip is then changed on the spatula, the handle being held in the palm, with the forefinger extended to the middle of the top of the blade. The grip is then changed on the mixing bowl so that the base of the bowl is flat on the left palm. The moldite is scraped into a ball, onto the middle of the side of the bowl nearest to the doctor—then spatulation is continued vigorously until the total time elapsed from the time the water is first added is ninety seconds. With experience, this time may be decreased or increased, the limits being one to two minutes total time elapsed. The spatulation is done most effectively by slapping the moldite forcibly, drawing the edge of the blade across the bowl so that the edge cleans the bowl. About three strokes are made from right to left, then three strokes from left to right, etc., the edge of the spatula blade being turned each time. If the moldite spreads over the bowl, it is scraped back into a small ball and respatulated.

When properly mixed, the impression material is a viscous, semi-solid, semi-liquid substance, which will flow slowly when tilted. It will become increasingly liquid on further spatulation, unless the water used was too warm, or unless there was not enough water used. If either of the above mistakes is made, the moldite will "set" while it is being spatulated or while it is being put into the molding shell. When properly mixed, it should not begin to set until at least a minute after spatulation ceases. If the material is sufficiently liquid after a total mixing time, including spatulation, of one minute, spatulation should cease at the end of one minute; otherwise at the end of one and a half minutes; or even two minutes, depending on the appearance of the mixture. If the water used was too cold, or there was too much water used, the mixture will be too grainy and too liquid.

Filling Impression Shell:

When the moldite is properly spatulated, it is scraped into a ball onto the spatula, which is scraped off into the bowl once or twice until it is nicely rounded, then picked up on the tip of the blade of the spatula. The molding shell is held in the left hand by the bottom of the handle, and the ball of moldite is scraped off into the cup of the molding shell, pulling the blade down almost vertically. When only a quarter inch of the blade projects above the shell, the blade is tipped down into the moldite and used to press the moldite through the holes in the shell, the blade being withdrawn in one continuous sweeping movement. The shell is then rotated and the moldite is pressed down all around the shell in the

same manner by the tip of the blade, which is never lifted out of the moldite, but always wiped off on the sides of the top of the shell. The shell should be lifted above eye level and examined to make sure that a little ball of moldite has been pressed out through *every* hole, thereby anchoring the impression to the shell.

The center of the moldite filling the shell is carefully pressed down as the moldite is pressed home, so that there is a slight concavity in the center, but care is taken to leave no edges of the shell bare. Obvious bubbles in the moldite are broken by vertical spatulation with the edge of the spatula.

Position of Doctor:

In contrast to the technique favored by some instructors, we recommend that the doctor stand at the right of the patient, and his assistant stand at the left. The doctor's feet should be spread far enough apart so that his body is well balanced, and he should be close enough to the patient's head to be able to work freely, without obstructing the patient's view of his appropriate target. A quick rehearsal of the arm and hand movement is useful to check against the possibility of obstructing the patient's view. This is also useful in rehearsing for the patient the fixations expected of him.

Insertion of the Shell:

1. Grip: The handle is held in the middle, on the narrow side, with the thumb and middle fingers, which grip the opposed narrow edges, while the forefinger is used to support the end of the handle. The moldite is kept level in the shell to avoid spilling it. The temporal mark is positioned as though for the doctor's own eye.

FIG. 2

2. Raising the upper lid: This is accomplished by firmly gripping the upper lid at the lid margin and rolling it up and away from the eye in such a manner as to produce a large open pocket. This grip is maintained until the superior flange of the shell is completely under the upper lid.

3. Point of first contact: The shell is always placed on the superior sclera as high above the cornea as possible and on the horizontal quadrant which is furthest from the doctor—namely—upper nasal for the right eye and upper temporal for the left. A minimum area of contact is made, with only the top edge of the shell, *the rest of the shell being tilted away from the eye in order to avoid touching the cornea,* until the upper lid has been gently lifted over the top half of the shell.

4. Rotation: On the first contact, the horizontal mark on the temporal flange of the shell makes a 30 degree angle with the horizontal axis of the eye. The right mark is below the horizontal, the left mark is above the horizontal. The shell is always rotated *clockwise,* with about a thirty degree turn, on *both* insertion and removal, for *both* eyes.

Patient's Fixations:

1. While the assistant is attaching the tape, which is done while the doctor is pressing the moldite into the shell, the patient looks up toward his hair.

2. Just prior to the first contact made with the shell, the patient looks *down* as far as he can without moving his head. It is frequently advisable to have him hold a pencil for a target, and the doctor should rehearse the molding procedure to make sure that he doesn't block the pencil from view of the fixating eye. This is particularly important in the case of the left eye, where the doctor has to reach around in front of the patient's hand in order to avoid blocking the pencil from the patient's view. Obviously, the patient holds the pencil in his left hand when his right eye is being molded, and in his right hand when his left eye is being molded. This fixation buries the cornea well below the lower lid and increases the superior pocket.

3. "Look at the target, now" (the fixating light). This instruction is given after the doctor has made his initial contact, lifted the upper lid onto the shell by rotating the shell thirty degrees clockwise and at the same time having inserted the shell upwards *as high as it will go* under the upper lid, while keeping all of the shell except the upper flange well away from the eye. When the upper lid is well over the shell, and not before, the doctor says, "look at the target—now." This is a signal for three people, the patient, the doctor, and the assistant.

At this signal:

1. The patient looks up at the target and continues to do so.

2. The assistant rolls the lid down firmly and continues to hold it down.

3. The doctor pivots the shell, with the top flange held fixed, so

that for the first time the entire shell is made tangent to the globe. Then, maintaining *tangency and contact* he raises the shell with an upward translatory movement that follows the contour of the globe, which raises the inferior margin of the shell until it is above the pocket in the lower lid which has been produced, and is being held, by the assistant. At his option, the doctor may perform the upward translatory movement by hooking the middle finger of his left hand around the base of the handle of the shell below the three fingers of his right hand, and at the same time moving to a position directly behind the patient, instead of at his right side. He is then able to draw the shell in a rotary upward movement toward himself without tilting the handle from perpendicular, and in this manner he maintains good tangency and has favorable leverage.

The upward look of the patient, the downward roll of the lower lid by the assistant, and the upward translatory rotation of the shell tangent to the globe are all performed *simultaneously*. When the lower edge of the shell snaps onto the lower sclera as the lower lid is pulled out from under the shell, the doctor then makes a *downward* translatory movement of the shell, following the globe contour, so that the lower edge of the shell is slipped into the lower lid pocket and the handle of the shell is *brought down* into the position where the handle of the shell points at the fixation target. When this has been successfully completed, the doctor instructs the assistant to "let go" of the lower lid, although a well-trained assistant will not need to be told. The doctor then adjusts the position of the shell with a slight twist of the handle so that the temporal mark on the shell aims at the outer canthus. He then releases the handle and removes the tape with a horizontal twist. The downward translatory movement is made with the right hand. The cue to start the downward rotation is received through the sense of touch. The fingers of the right hand must become sensitized by experience so that they can feel the impact of the lower edge of the shell as it slips past the lower lid and snaps onto the sclera. The visual aids here are poor, as the excess moldite usually obscures the relationships of the lower lids and the lower edge of the shell. However, a visual sign that indicates whether or not the lower lid has been successfully positioned over the shell is the direction in which the handle of the shell points after it is released by the doctor. If it points considerably above the target, the lower lid is still caught, and must be released quickly by repeating as much of the preceding as necessary.

Note—Immediately after the shell is successfully inserted under the

lids, the assistant wipes out the moldite from the rubber bowl until it is practically clean with a piece of Kleenex, and then washes the bowl carefully. As the moldite is insoluable in water, it should never be thrown into the sink, as it will clog the drain. If the bowl is not cleaned immediately, it will be exceedingly difficult to clean after the moldite has set.

Importance of Maintaining Fixation:

During the process of inserting the shell, as well as while it is in place afterwards, the doctor and the assistant must be alert to the control that the patient maintains over the fixations required of him—and the doctor should stop all forward motion, without retreating, or losing any ground he has gained, whenever the patient either closes the fixating eye, or moves it to a wrong position. At such a time, the doctor must persuade the patient to re-open his eye, and fixate it on the proper target. The assistant should be instructed beforehand that if at any time the patient closes the fixating eye, the assistant should reach over with his free hand and gently raise the patient's upper lid and continue to hold it open with a very light touch. After the doctor, with the assistant's help, has gently persuaded the patient to correct his fixation, then, and only then, does the doctor advance from where he left off. If during this procedure of starting and stopping and starting again the cornea becomes immersed in moldite, it is just as well, as the patient will more easily adjust himself to the initial coolness of the moldite. In the rare event that the doctor is unable to complete the insertion of the shell due to the patient's inability to cooperate and the necessity for avoiding any forcing by the doctor, the moldite which is left in the eye is permitted to set before any attempt is made to remove it. It sets in one piece, which is then easily lifted out.

Setting Time:

One or two minutes is required for the moldite to set after the shell is on the eye. As the moldite sets, it loses is glossy finish and becomes dull. At this time it is tested by touching it with the impression hook. In the average case, counting the total time from the instant the water is added, spatulation ceases after 90 seconds, the shell is filled after 120 seconds, it is on the eye and rotated into position after 200 seconds, and it is set firmly enough for the excess moldite to be removed after 320 seconds.

Removal of Excess Moldite:

When the impression material is set, the doctor instructs the patient to maintain his fixation and warns him that he is about to remove the excess material. The doctor then rolls the upper lid upward in one long

sweeping movement of his left thumb which frees the upper lashes, at the same time lightly holding the handle of the molding shell with his right hand, avoiding any downward pressure. The assistant then hands him the impression hook, which is passed around and never over the patient. The peripheral edge of the excess moldite on the temporal or nasal lid margin is gently raised until it can be lifted with the fingers, if possible, and is then pulled down and in until it breaks off. The hook is used if the doctor cannot grip the moldite with his fingers.

In using the impression hook, the doctor must counterbalance with an opposed finger any tendency of the handle of the shell to move as the moldite is broken away. In doing so, he must not exert any more pressure than needed to counterbalance the opposed forces, as any movement or downward pressure on the shell can be quite painful and may cause the patient to squeeze his eyes shut convulsively.

Removal of Shell:

After the excess moldite has been removed, the doctor inspects the alignment of the temporal mark. If it is not perfect, he makes a new mark with a red cellophane marking pencil, and at the same time marks the nasal line to the inner canthus. All marking is done with a single light stroke radiating away from the cornea toward the periphery. Two dots will suffice.

The doctor then instructs the patient to look toward his hair, at the command "now;" at which time the doctor gently grips the *narrow edges* of the handle between the thumb and middle finger of his left hand. The thumb is on the near side and the middle finger is on the far side of the handle, and not on the front or back of the flat side of the handle. The little finger of the doctor's left hand is balanced on the patient's forehead. The doctor then rolls the patient's lower lid under the lower edge of the shell with the side of right thumb and presses on the globe with the side of his thumb. At the same time, he lifts the shell slightly with his left hand and turns it gently 30 degrees clockwise until the adhesion is broken, and as the shell leaves the eye, the doctor lifts the shell high enough so that the bottom edge of the impression clears the lower lid and the top edge clears the cornea. The doctor removes the shell from the eye in an arc parallel to the globe, with particular care to avoid scooping the shell across the cornea.

Fixing Bath:

After the shell is removed, the assistant places it in a plastic template, which is then submerged in the wine glass which is filled with the fixing bath solution. The fixing bath is 1% potassium sulphate (made by dis-

solving one 15½ grain tablet in 100 cc. of tap water). It is important to make sure that the impressions are completely immersed in the solution and not exposed to the air. They need 20 minutes for minimum fixation, but may safely remain in the bath overnight.

Cleaning the Patient's lids:

The doctor removes any loose particles of moldite which are left in the eye with the aid of a long-handled cotton-tipped swab, moistened with buffer fluid at body temperature. Extreme care is taken to remove every particle, and to avoid touching the cornea. The lids are then carefully wiped clean with the swab. This is *rechecked* after five or ten minutes to make sure nothing has been ove ooked before the patient is dismissed. Before the patient leaves the chair, however, the eyes are first checked very carefully by means of the fluorescein test.

Fluorescein Test:

A drop of fluorescein is dropped on the upper sclera. The patient closes his eyes and rotates them. The cornea is then examined with an argon lamp in a dark room. Any fluorescent spot on the cornea indicates an abrasion which requires immediate medical attention. Such an abrasion can never occur unless the cornea is struck by the edge of the shell, which should never happen if the doctor is reasonably careful. (Note: 2 per cent aqueous fluorescein is used, i.e., 2 per cent fluorescein, 3 per cent sodium bi-carbonate, 95 per cent distilled water). The eyes are then irrigated with warm buffer fluid and another inspection is made to make sure that no particles of moldite have been overlooked. Any particles which may be present are now stained green and are easily discovered.

Technique without the Aid of an Assistant.

While the authors favor the doctor-assistant technique of molding described above, there are occasions when the doctor finds himself forced to work single-handed. In this case there are two alternative "one-man" techniques.

(a) The patient not assisting with the lower lid.

After the shell is inserted well under the upper lid, it is no longer necessary to maintain the "pocket" which has been made by the left thumb. Without releasing the grip on the shell by the right hand, the handle is *also* grasped by the *left* hand, in the same manner as described in the technique of *removal* of the shell. As soon as the handle is firmly gripped in the *left* hand, the right thumb is shifted to the tape and is used to pull the lower lid down, while the upward translatory move-

ment and the re-seating of the shell into the inferior pocket is performed with the left hand.

(b) The patient assisting with the lower lid.

In this technique the patient is rehearsed beforehand in the role normally performed by the assistant, in pulling the lower lid down at the proper instant. This technique is highly favored by some, like Dr. Meredith W. Morgan of the University of California, who contends that the patient is so absorbed in pulling his lid down properly that he does not get as nervous as he might otherwise. We have found the technique to be quite simple with cooperative patients. However, as it is unpredictable beforehand as to whether any given patient will become panicky, we feel that it is better for the doctor not to rely on the patient for any positive assistance as he will not get it from a patient who becomes panicky.

Anesthesia Technique: (To be used only when a registered physician is assisting and is actually present.)

1. Three drops of ½% Pontocaine, ophthalmic solution, are placed in each eye, (one drop at a time) at one minute intervals. Immediately after the third drop of pontocaine has been instilled in each eye, one drop of adrenalin (Adrenalin ophthalmic solution 1:1000) is also instilled in each eye.

2. Just prior to the molding of the other eye, another drop of the pontocaine and the adrenalin are instilled.

3. Whenever anesthesia is used, the patient must be emphatically warned not to rub his eyes for several hours afterwards. The doctor must be doubly sure to leave no particles of moldite in the eye, and to be sure that there has been no abrasion of the cornea.

The same care and skill which is required to make impressions without anesthesia is required even when anesthetics are used, as the patient is just as likely to flinch and close his eyes and fail to cooperate when his eyes are anesthetized, as when they are not. These reactions are psychological. There are two hazards which make this technique less desirable for the optometrist, even though he has an ophthalmologist standing at his elbow to assist him. First of all, the anesthetic makes the cornea slightly softer and dryer, and thus more vulnerable to abrasion; and secondly, the optometrist may have a false sense of security and may not be alert enough to stop forward movement of the shell if the patient momentarily loses control (which he is just as likely to do with *either* technique). Thus the optometrist who uses the latter technique will do so primarily to further his inter-professional relationships with his

ophthalmological colleagues, and he must work with the same care and skill as though he did not have the assistance of the anesthesia and the physician.

IV. PROCEDURE FOR MAKING STONE POSITIVE CASTINGS

1. The impression shell is removed from the fixing solution. The surplus water is shaken off, and the impression is carefully inspected for air bubbles between the moldite and the shell. If an air bubble is present, it will produce a "blister"-like bulge in the impression. The blister must be pressed out, piercing the impression with a sharp pointed toothpick if necessary.

2. The impression shell handle is placed in the hole provided in the plastic template, as shown in Diagram A, Figure 3.

3. The template is placed with the impression shell on a small-mouthed deep glass such as a whiskey glass. The handle should be kept perpendicular. Diagram B, Figure 3.

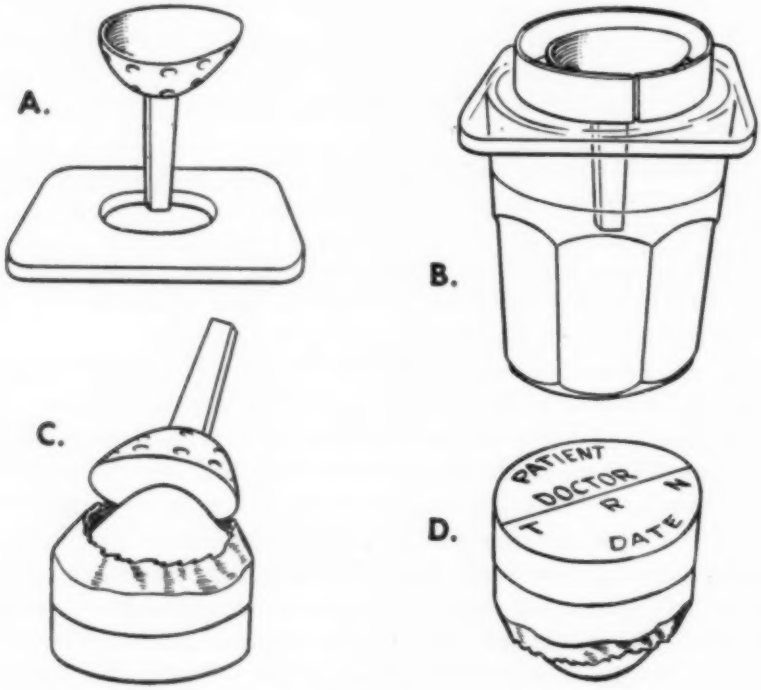

FIG. 3

4. A moderate quantity of "Diolite" impression stone is mixed

with great care to avoid bubbles. We recommend the following procedure:

About ¾ of an ounce of water is placed in a large rubber mixing bowl. Diolite is shaken into the water a little at a time with a small spoon, and the bowl is squeezed as the Diolite is added, until the mixture becomes putty-like in consistency. It is then spatulated briefly with "knife-like" slicing strokes until it will flow slowly when dropped off the spatula. If bubbles are seen in the mixture, the bowl should be pounded on the table until the bubbles are for the most part eliminated. Any remaining bubbles can be broken when the Diolite is poured if the stone is "vibrated" into the impression as described below.

5. One brass split ring is placed on the template—well centered over the impression shell. The casting stone is poured by picking it up with the spatula and flowing it into the center of the impression. The stone is vibrated with the spatula in an up and down motion. This operation is continued until the stone completely fills the impression and overflows to fill up the first brass ring. Activation is continued with the spatula until any air bubbles present are all released.

6. This operation is repeated, one ring at a time, until the cast is built up three rings high. One hour is allowed for setting.

7. The stone cast is removed from the glass. The plastic template is removed and the split rings are removed by breaking them open with a knife and slipping them off the cast.

8. With an indelible pencil, the temporal stripe of the shell is marked to the outside edge of the casting. The line is then continued to the bottom edge of the cast, in a line perpendicular to the base, and marked with a "T." The nasal side is similarly marked, using the edge of the handle as a guide for the position of the horizontal axis. The author's impression shells are marked on the *temporal* flanges, a red stripe being used for the right shell, and a green stripe for the left. Where the doctor has added a correcting mark with a red wax pencil in order to indicate a slight shift of the horizontal axis out of position, enough stone must be cut away to reveal the correcting guide mark before the exact position of the horizontal axis can be determined. As soon as this has been done, the doctor can indicate on the base of the cast the true position of the horizontal axis, being very careful to indicate the nasal and temporal markings. Then following the form as shown in Diagram D, Figure 3, the patient's name, the doctor's name, and the date are also added. In the middle of the horizontal axis, the letter "R" is used to indicate the right cast, and the letter "L" is used to indicate the left cast.

9. The stone is then cut away with a dental-stone knife in order to free the impression shell. If the stone has set so that it is quite hard, the top half of the cast is continually dipped in a bowl of water to soften the stone so that it cuts very easily. The stone is cut following the profile contour of the shell until the stone surrounding the shell is about one mm. thick. At this time, the doctor can break away a considerable portion of the remaining stone with his fingernail, making the stone a little thinner where it resists being broken away until it is thin enough to be removed easily with the fingernail. The plastic impression shell can easily be cut through with the stone knife, but if the doctor is careful to follow the profile contour of the shell, until the stone is thin enough to be removed with the fingernail, he will have no difficulty in removing the shell without cutting it. After the shell has been removed, the impression material is destroyed, the shell is washed, cleaning the holes with a tooth pick; and if the doctor has scratched or cut the shell with his knife, the scratches are removed by buffing and polishing on the dental lathe.

For the doctor who is experienced in working with dental stone, a more hazardous but simpler technique of removing the shell can be used. But experience and good judgment are required as the entire impression can easily be destroyed by this method. The setting time of the stone will vary in each case depending upon the exact amount of stone and water used, the nature of mixing and spatulation, the type of stone used, and so forth. With experience, the doctor can know when the stone has set to the consistency of chalk (with diolite, in ten to fifteen minutes after it has been poured), and at this time the shell can be cut out in a matter of a few seconds. The biggest danger in attempting to use this technique is to remove the top brass ring, (through which the handle of the shell emerges) before the stone is set, in which case the entire impression is ruined. Therefore, when the doctor thinks that the stone has set firmly enough to be worked on (after testing the base with the point of a knife or pencil), he must remove the *bottom* ring from the *base* of the cast, and if he is premature, no appreciable damage will result. A second hazard is that even if the rings are successfully removed, the stone may be soft enough so that if he attempts to take a thick slice with his knife he may break the impression in two, so that he must be careful to avoid this mistake. The stone should be dry and should have the consistency of chalk and should not crumble when cut. In this technique, the stone can be removed with the fingernail when it is about 2 mm. thick. A third limitation of this technique is that the time between the "initial set" and the "final set" is very short, so that if the doctor delays an extra

five minutes, the stone becomes so hard that he has to use the conventional technique of dipping the stone in water in order to soften it. Diagram C, Figure 3 shows the appearance of the cast as the shell is removed.

V. REFRACTION PRINCIPLES

1. Basic Optics:

1. The cornea is for all practical purposes neutralized by the water lens, as they have approximately the same index of refraction. Thus all corneal astigmatism is abolished.

The dioptric power of the cornea is replaced by the equivalent dioptric power of the optical system formed by the combination of the contact lens and the liquid lens.

2. The total power of the contact lens and liquid lens system can be increased or decreased by (a) grinding plus or minus power on the front surface of the contact lens, (b) increasing or decreasing the radius of curvature of the inside corneal surface of the contact lens, (c) increasing or decreasing the thickness of the liquid lens.

2. Basic Procedure Generalized:

A trial contact lens of known specifications (inside corneal radius and power in air) is filled with buffer fluid and inserted under the lids. The patient then is refracted as though he did not have the contact lens on, and the amount of spherical lens power and the vertex distance of the supplementary spectacle lenses used in arriving at the prescription is recorded. This prescription should consist of the maximum plus through which the patient obtains the best visual acuity, unless the doctor has previously prescribed an "under" or "over" correction for him in his regular glasses, in which case the equivalent "under" or "over" correction can be prescribed. It is noteworthy that accommodation seems to be much less arduous for myopes when they wear contact lenses instead of spectacles, and it is typical to find that a young myope who has been undercorrected for distance with spectacles, or who has been given a reading add, may be given a full correction without a reading add. Actually less accommodation is needed when contact lenses are worn than when spectacles are worn, so that the above observation is really not as controversial as it may seem to some.

Routine of trial lens refraction—monocular with trial frame:

1. The trial lens is cleaned with a wetting agent, filled with buffer fluid, inserted under the patient's lids, and carefully inspected.

2. The prescription is obtained monocularly by means of retino-

scopy and subjective refraction, determining the approximate *sphere only*, to the nearest quarter.

3. The vertex distance between the center of the back surface of the spectacle lens and the vertex of the cornea of the contact lens is measured, using either a vertex gauge, or replacing the spectacle lens with a stenopaic disc and inserting a thin steel rule through the slit until it barely touches the contact lens.

4. Optical data required:
   (a) Correction in spectacle frame.
   (b) Vertex distance.
   (c) Power of test lens in air.
   (d) Inside corneal radius of test lens.

Explanation of Routine:

The trial lens refraction is done monocularly, and with a trial frame instead of a refractor, for the following reasons:

(a) A trial contact lens fits so poorly that it may develop bubbles on slight rotation of the eyes.

(b) It may be very difficult to remove if it is worn for more than a few minutes.

(c) The lens causes undue tearing, and the lashes may smear the spectacle trial lenses used, and as this occurs, they must be cleaned.

(d) The test lens may be decentered downward, producing a false astigmatism.

Summary of Sources of Error in Trial Lens Refraction:

1. Bubbles present in the liquid lens, or the liquid lens absent.
2. Bubbles forming while doing the refraction.
3. Tears, which must be blinked away.
4. Induced astigmatism which is produced by the poor centration of the trial contact lens on the eye with consequent lack of coincidence of the optical centers of the various lens systems involved. The error is corrected to some degree by having the patient support the trial lens with a finger so that the lens is better centered.
5. Wet eyelashes smearing spectacle lens.

Refraction with Semi-corrected Lenses:

In our laboratory, the optical correction is usually not ground into the patient's contact lenses until *after* the semi-finished lenses (which are made without optical surfaces) are first fitted to the satisfaction of the doctor. At that time, the doctor marks the desired optical centers with a red wax pencil, in a manner similar to the technique of measuring the distance P. D. The patient looks at the doctor's open eye, just as in the

P.D. measurement, and the doctor marks the location of the center of the pupil of the patient as seen through his contact lens. The margin of error is reduced if the patient's pupils are constricted by means of a bright light.

In this manner the laboratory is assured that the correction will be properly ground coincident with the visual axis of the patient.

When the first correction is ground into the patient's lenses, the lenses are known as "semi-corrected."

A *binocular* refraction is done with the semi-corrected lenses, great care being taken to ensure that the front surfaces of the lenses are properly moistened. A chemical wetting agent available through any contact lens laboratory is indispensable here, although in the early days, the patient wet his lenses quite adequately but inelegantly, by running his tongue over the outside of the corneal section.

The lenses should be worn by the patient for at least five minutes before the refraction is made. The routine used is the same as the doctor would use in his spectacle work, except that no attempt is made on this refraction to use correcting cylinders. Where astigmia seems to be present, the spherical equivalent, as determined by the best sphere, is used.

If the new Rx called for is not more than plus .50 D., or minus .75 D., another appointment is made for a week later and the patient is instructed to wear his lenses daily for that time. The reason for delaying the decision is that small errors seem to fluctuate and the prescription is not stable until the patient has worn his lenses for at least a week. If the error is more than plus .50 D. or minus .75 D., the change is prescribed at that visit, and the patient is re-examined when the lenses are returned by the laboratory. A recheck is scheduled for at least one week later before a second-re-grind is called for. If a very small error is found at that time, it should be re-checked again before ordering any new change.

On request, the semi-finished lenses can be made with the semi-corrected prescription, as is done by most other laboratories. While we feel that it is a less scientific and more fallible procedure, it is used where the doctor prefers. Where this procedure is used, and the laboratory arbitrarily determines the placement of the optical centers, there is a greater likelihood of induced astigmatism in the lenses if the centers are incorrectly placed. Where this occurs, the doctor marks the proper location of the centers and either the correction is re-ground to the new centers, where this is mechanically possible, or if not, a new pair of lenses are made from the old casts.

Cylindrical Corrections:

The technical difficulties introduced into the mechanics of grinding cylindrical corrections into contact lenses today are still very formidable. In our laboratory, we grind the cylinder into the back surface of the corneal section of the lens, and since the difference in indices of the plastic (1.49) and the buffer fluid (1.33) is only .16, for every diopter of cylinder ordered by the doctor, 3.12 D. of cylinder must be ground into the contact lens. The absolute value of the correction will vary with the inside radius used and the thickness of the water lens, so that it is not easy to predict what it will be.

Furthermore, we do not find it practicable at present to attempt to grind a cylinder at an oblique axis, so that all corrections have to be translated into the equivalent best approximation at axis 90 or axis 180. We recommend that if the doctor finds an oblique axis, he deliberately move the axis of the correcting spectacle lens to 90 or 180, and determine the best approximation for that axis subjectively, rather than to have us do it theoretically. He may find that he is just as well off with the spherical equivalent, or even better off, particularly if the lens has the sightest tendency to rotate when the eyes are rotated. Obviously, if the cylinder is rotated off axis, it is worse to have it present than to leave it off altogether.

It cannot be over-emphasized that the primary cause for the indication of cylindrical corrections is the displacement of the optical center of the contact lens correction with respect to the visual axis. The best way to remedy this fault is not by grinding an approximate cylinder into the lens, but by re-making the lenses with more perfect centers. This may or may not necessitate re-molding. If this does not cancel out the need for cylinders, they are ground in as a last resort. Two or three sets of lenses may have to be made before the correction is satisfactory.

The doctor must mark the horizontal axis of the lens on the eye with a red wax pencil before returning the lenses for cylindrical corrections.

We would strongly discourage the use of cylinders in all but the most exceptional cases. It is well known that small cylindrical corrections usually disappear spontaneousy within a month after the contact lenses are first worn. Furthermore, during the first week, the correction is highly variable, and the doctor's findings are quite inconsistent, a contributing factor probably being unevenness of the moistness of the front surface of the lens. The doctor should definitely not even place cylinders

in front of the patient's contact lenses until he has exhausted all other possibilities.

Prisms:

Prisms can be ground in contact lenses, although they are needed only in extremely rare cases. Here again, there are technical difficulties which usually make it necessary to make two or three pairs of lenses before the exact amount of prism needed is obtained.

High Ametropia:

In doing the trial lens refraction for patients with high ametropia, it is advisable to use a trial lens into which a correspondingly high correction has already been ground, rather than to use a plano lens, because the additional spectacle power required to refract the patient with a plano lens makes the test relatively less accurate. In the case of high myopia, the high minus power of the supplementary spectacle correction gives the patient the same minification and aberration that his own spectacles give, and the V. A. achieved may be two or three lines short of what a high minus contact lens will give. In the case of high hyperopia, the test may be equally inaccurate due to the difficulty of aligning the centers of the spectacle lens and the eye, and the great distortion produced when centration is poor.

High Anisometropia:

One of the most gratifying uses of contact lenses is for the equalization of dissimilar sized images resulting from anisometropia. As fusion is abolished if the images seen by the two eyes are dissimilar in either size. shape, color, or clarity, size differences may cause dissociation and squint. In monocular aphakia, for example, the size difference may be between 25 to 33 per cent. A single contact lens worn on the aphakic eye will reduce the difference to between 13 to 16 per cent, while a pair of contact lenses will reduce the size difference to three or four per cent, which is normally within the limits for satisfactory fusion.

A squint due solely to the size differences resulting from high anisometropia is instantaneously corrected when two contact lenses are worn. Where some amblyopia is present in the deviating eye, this must be corrected by training before the squint is abolished. With the size *difference* corrected, the amblyopia is readily amenable to correction by conventional treatment.

VI. PROCEDURE FOR FITTING SEMI-FINISHED LENSES

Preparation:

All necessary fitting accessories should be prepared before the patient arrives.

a. Buffer solution (warmed to body temperature).
b. Sterilizing solution.
c. Wetting solution.
d. Fluorescein (2% Fl.—3% $NaHCO_3$—95% distilled water).
e. Dental throw apron.
f. Facial tissues.
g. Marking pencil (red wax—well sharpened).
h. Argon bulb.
i. Physical fitting chart (filled out).

Before a pair of new semi-finished contact lenses are inserted under the patient's lids, they should be immersed for several minutes in a sterilization solution. (1:500 Metaphen or 1:1000 Merthiolate). After sterilization, they should be immersed in a wetting agent and rinsed thoroughly in cool water. The lenses should not be dried. The lens should be half filled with buffer soution, 1 drop of fluorescein should then be added, and then it should be filled with buffer fluid and inserted under the patient's lids.

Preliminary Analysis:

Clinical experience has proven beyond doubt this important fact: A *final* diagnosis of the physical fit of contact lenses should not be arrived at until the patient has had a minimum of two hours' total wearing time.

This can be done in stages of one or two sittings, or more if necessary. Therefore, the doctor's first analysis should consist mainly of a quick determination of the ability of his patient to accept the lens for a brief wearing period. If, after inserting one or both of the lenses there is no immediate radical discomfort, the patient should be permitted to wear the lenses for a few minutes before any detailed inspection is made. The initial reactions of lachrymation and blinking and confusion should be permitted to wear off first. A pair of multiple pinhole spectacles are often very useful in aiding the patient to make a speedy initial adjustment.

After the initial adjustment has been made, the corneal and limbus clearance should be checked with the argon bulb. The clearance obtained should be indicated on the physical fit chart. If it is satisfactory, the

chart should be marked accordingly. If additional limbus clearance is wanted, the amount and position should be noted and marked on the chart so that this can be requested from the laboratory. No more should be done at this time! The patient should be sent into the waiting room for a tolerance trial. After fifteen to twenty minutes, the patient should be briefly checked. The patient's reactions and a quick inspection of the lenses will aid the doctor in determining how long the patient has to sit before a more detailed inspection can be made. When this time has come, the patient is returned to the examining room and the analysis is continued and noted on the fitting chart.

Corneal and Limbus Clearance:

1. Corneal and limbal clearance should be checked very carefully with fluorescein under the light of an argon bulb or a cobalt blue lamp.

2. The fluorescein pool should extend at least 1 to 2 mm. beyond the cornea.

3. There should be no corneal contact in any rotated position of the eye within a 30 degree turn from the primary position.

4. Excessive limbus clearance should not be ordered from the laboratory. The more the limbus clearance is increased, the more the lens will slip around, bump the cornea, and produce prismatic and optical and cosmetic defects.

5. In observing the fit of the lens after the first wearing: If no fluorescein can be seen surrounding the cornea at the limbus area, an excessively tight fit at the limbus should be suspected, and the lens should be removed within fifteen minutes after insertion. If the lens clings when the patient's lids are completely relaxed, and the doctor uses the proper technique for removal, then the harder the lens clings the more limbus clearance is needed.

The authors recommend that instead of attempting to rock the lens with the suction holder and "hinge" it off, the lens be simultaneously *rotated* and *pulled* straight out. The rotation is such as to turn the nasal flange up under the upper lid. The limbus area of the eye is spherical, while the sclera is toroidal. As the lens is rotated out of position, the scleral fit is broken and if the limbus clearance is adequate, the lens does not cling. If the limbus clearance is inadequate, rotation does not disturb the limbal fit (since the limbus is spherical) consequently the lens clings to the limbus.

6. Every time the doctor removes a lens from an eye, he should be alert to recognize limbal clinging in removal. Sometimes the lens will not cling after one and a half hours, but it may cling badly after three or

four hours. No attempt should be made to increase limbal clearance except perhaps on semi-finished lenses, as the doctor will most likely ruin the optics on finished lenses.

Overall Contour Size:

The lenses should be checked for size in relation to the configuration of the restraining tissues in the patient's palpebral fissures. We recommend as large a lens as the patient can successfully insert and remove, and wear comfortably without any interference with free rotation of the eyes. When the doctor is satisfied that the size of the lenses is suitable, the fitting chart is marked accordingly, eg., "contour O.K." However, if the lenses need contour modification, both the lenses and the chart are marked accordingly; and before any further diagnosis is made, the laboratory routine of modifying is completed, and the patient is refitted. The contour is modified to the doctor's satisfaction before any further diagnosis or adjustment is made.

Scleral Fit: (a) open areas:

We are now ready to consider the scleral fit. Here we are concerned principally with "open areas" and "tight areas." An open area is that part of a lens that does not rest on the sclera, but stands away from it. Open areas can be accurately located by placing one or two drops of fluorescein on the sclera just above the superior flange of the lens. This is allowed to seep around the periphery of the lens and is inspected under the glow of an argon bulb. Any part of the lens not in contact with the sclera will allow fluorescein to enter and will define the open area by the characteristic green fluorescent glow. This area can be marked with a red wax pencil and properly "closed," as described below.

The following considerations are significant in the diagnosis and analysis of open areas:

1. Very slight open areas on the extreme periphery may produce no sensations, form no bubbles, and should be disregarded.

2. The area may not be large enough to form bubbles, but may produce uncomfortable sensations. If these sensations can be made to disappear by holding the lids away from the lens while the eyes are rotated, there is very good indication of a loose area. The patient can typically localize the exact spot for the doctor, and this is confirmed by the flourescein test. The patient usually reports these areas as being "tight."

3. They may not be apparent in the primary position, but on rotation they may be seen at the extreme periphery. If the contour is large enough, those open areas which do not produce bubbles should be cut off by reducing the contour.

4. If the open area is large enough so that bubbles are formed, the defect is a very grave one. If the open area is moderate in extent it can be successfully closed; however, if it is extensive, it may be better to scrap the lens, re-mold, and get a fresh start with a good impression.

After the open area has been identified and marked on the lens, there are three methods of dealing with it:

1. Disregard it.
2. Cut it off by contouring.
3. Close it by means of the "stone model—buff wheel" method described below.

Scleral Fit: (b) tight areas.

Tight areas as a general rule are not felt or reported by the patient. Their existence has to be determined and treated as carefully as open areas. A tight area produces a dead white blanched area on the sclera. Blood vessels can be followed to the outer edge of the lens, then disappear and re-appear beyond the boundary of the lens. After a short wearing period the lens will leave a marked indentation on the sclera. If a "tight area" diagnosis is made too soon after the lenses are inserted, the apparent lack of uniform whiteness of the sclera may suggest a tight lens. In addition to this, the reaction of patients wearing contacts for the first few times varies greatly. Many have excessive tearing, injection and redness. Some clear up readily and present a good picture from which a proper diagnosis can be made. Others take more time to get to this point. Therefore, the longer the patient can wear the lenses before the final decision to relieve a tight area is made, the better the results will be.

Authors' New View on "Tight Areas."

Tight areas are to be considered only if they appear in the *primary* position. If rotation produces a slight tight area which does not appear in the primary position, disregard it. Rotation is momentary, and any attempt to fit a lens to every possible shape that the eyeball will take when it is rotated into different positions we consider to be utterly futile.

Conlogue's Post Fluorescein Test:

A major contribution to the techniques of diagnosis of the fit of contact lenses is the procedure first outlined by Dr. J. B. Conlogue of Peoria, Illinois.* The lenses are worn for 45 minutes with fluorescein in the buffer fluid (two drops). The lenses are removed, the eyes are irrigated with warm buffer fluid, and an immediate careful inspection of the eyes

*Post-Fluorescein Test in Contact Lens Fitting. Jerome B. Conlogue. American Journal of Optometry and Archives of American Academy of Optometry. Vol. 24, No. 2, pp. 71-73 - February, 1947.

is made with blue light in a dark room. If any fluorescence is observed on the cornea, limbus, or sclera, a mental note is made of the location of the fluorescent areas, the lenses are immediately re-inserted with clear buffer fluid, and the areas previously noted are re-illuminated with blue light, and marked with wax pencil.

The areas so marked are treated as tight areas and are relieved in the conventional manner. The entire test is repeated, preferably on a subsequent visit. The fit is not considered perfect until no fluorescent areas can be observed during the test.

Marking of Optical Centers:

After the fitting has been satisfactorily completed, the desired location of the optical centers is carefully marked on the lenses. A cellophane marking pencil with a carefully sharpened, long point is used. The doctor places the patient so that his right eye is directly in line with the patient's left eye and his left eye is lined up with the patient's right eye. The patient is instructed to fixate one of the doctor's eyes at a time in such a manner as to avoid convergence, as is done in the measurement of the distance P.D. A dot is placed in the apparent center of the patient's pupil, and from this dot, radiating cross lines are marked, from the center outwards, as shown in Figure 4.

FIG. 4

The lenses are removed and the marks are accentuated.

The importance of marking centers correctly cannot be over-emphasized. A delicate fine stroke should be made—the thicker the pencil line, the less accurate the placement of the center. As a one or two millimeter displacement of the center may introduce very disturbing optical difficulties, it is obvious that the marks should not be two millimeters thick. In order to make sure the markings are not rubbed off in handling or mailing, they should be duplicated on the inside of the lens. After the lenses are marked they should be returned to the laboratory, together

with the necessary trial refraction data, including trial lens radius and power, trial frame lens correction, vertex distance, and V.A. obtained.

VII. LABORATORY TECHNIQUE FOR MODIFYING AND ADJUSTING LENSES

The author's lenses are designed with as large an overall contour as the stone castings furnished to the laboratory normally permit. Consequently, the most typical laboratory "re-work" required of the doctor is to reduce the contour size slightly. Where the contour is too large, an entirely distorted picture of the fit results, with "open areas" and "tight areas" present which are induced solely by the excessive contour size of the lens. It is very important, therefore, to bring the contour down to its proper size before attempting to remedy *any other* apparent defect

Therefore, we recommend that all modifying and adjusting of lenses be done in the following sequence of operations:

1. contour;
2. open areas;
3. tight areas;
4. corneal or limbus touches (this is done by the laboratory only)

In the hypothetical case illustrated in Figure 5, the decision has been made to remove a small amount of stock as shown by the shaded area of the lenses. If this were done exactly as shown in the figure, the boundary of the lens would be extremely jagged. Accordingly, a blend must be made between that part of the contour that has been reduced in size and the neighboring untouched parts. In order to blend the old and new boundaries, the doctor must actually go considerably beyond the area he wishes to reduce in size, and imperceptibly blend one curve into the other, as shown by the dotted lines in Figure 5.

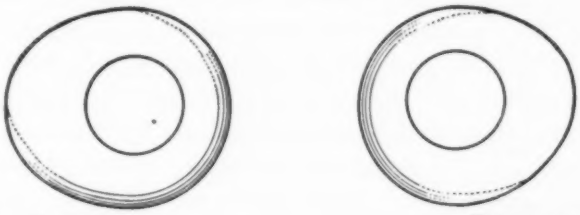

FIG. 5

To do this, an eight inch, single cut, smooth mill file is used. If this work is done on a semi-finished lens there will be no need to protect the optical area except with the fingers. If a prescription lens is to be worked on, two small round pieces of drafting tape are cut and used to

cover both the inside and outside of the optical portion. The lens is placed on the tip of the third finger so that the inside corneal part rests on it. The thumb is brought over the outside corneal part. Then the first and fourth fingers are placed under the outer tip of the lens. This gives a firm grip on the lens and exposes only that part that requires filing. (Figure 6).

FIG. 6

The file is held in any way that is natural for the doctor. Filing should be done in long sweeping light strokes, following carefully the general previous contour of the lens. The original contour of the lens is a smooth continuous series of curves with no flat spots or high points. It is important that every effort be made to blend the filing with the balance of the contour. It is a mistake to try to file too much in one cut. The lens should be rotated in the fingers, little by little, until the entire area is covered. It will be noted that the edge of the lens has been carefully rounded and smoothed. As filing is done, this rounded edge is removed, and a new, properly rolled edge will have to be made. The outer edge of the lens also will become thicker, because the scleral part of the lens tapers from the corneal section to the outside edge. This will have to be thinned out to the approximate thickness of the balance of the lens. In order to be able to re-thin the lens, and put on the rolled edge, it will be found that by filing at 90 degrees to the scleral walls this can be done very easily. Inasmuch as the curves of the scleral portion are continually changing it can be determined by observation whether or not the filing is being done at the approximately correct angle. The illustrations should clarify this to some extent. The doctor must not file at a sharp chamfer or bevel, as this will develop a sharp edge that *cannot* be smoothed or rolled. (Figure 7).

After the lens has been filed, it is ready for thinning (only if the

amount of stock removed necessitates this operation). The lens is held as before. With the file flat against the scleral part of the lens, about halfway between the optical portion and the other edge, and the same long sweeping light stroke, the lens is thinned down to the approximate thickness of the balance of the lens. Here again, it is important for the doctor to file *flat* and not on a bevel. After the thinning has been completed, the lens is ready for smoothing and rounding the edge, buffing the filing marks, and polishing the part of the lens that has been worked on.

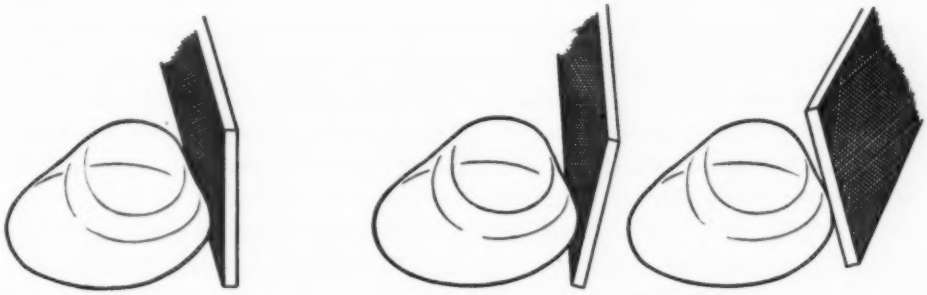

FIG. 7

The laboratory motor is mounted with two four-inch muslin wheels. The one mounted on the left hand spindle has buffing compound on it. This wheel is used first. The lens is held in the right hand in the same manner as though to insert it on a patient. That is, it is balanced on the first finger, with the thumb and third finger on the outer edges. The third finger of the left hand is then placed into the inside of the lens at any place that is convenient and natural in order to get a firm grip on the lens. The outside surface is buffed where filing has been done. Buffing should be done with the lens flat against the buffing wheel, in a smooth motion, both with and against the wheel. That is, the lens should not be held stationary against the wheel, but a sweeping up and down motion with both wrists should be made so that the lens *moves* across the wheel. The lens should be kept moving. It will burn and buckle otherwise. The buffing should not be overdone. It can readily be seen when the file marks are removed, and this takes but a moment of buffing.

The rolling of the edge is also done on the buffing wheel. The lens is held exactly as for buffing, but it is turned so that the edge can be held at 90 degrees to the face of the wheel. Both wrists are anchored on the

work table and the lens is placed lightly against the buffing wheel. This will put a small groove in the wheel. The lens is then rotated with the fingers so that the edge remains in this groove, and the lens is kept rotating until the edge is smooth and round. It is not necessary to go completely around the lens, but only around that part which requires it. This operation is completed with surprising speed and it must therefore be done cautiously.

The lens is ready for polishing. The only part of a lens that should be polished is the *outside* of the scleral portion. The doctor should *never try to polish the edge he has just completed.* A saw-toothed edge will be produced that can do considerable damage. The lens should be polished in the same manner as the file marks were buffed, then the doctor must *stop.* The lens should be washed and dried with facial tissue, and carefully *inspected.* It should be felt on the inside and the outside, testing with a finger over and under the edge. It has to be *perfectly smooth.* If it is, the patient can be re-fitted.

Despite the fact that the above may seem quite complicated, it is really very simple, as a trial on a practice lens will prove. In these operations, as in all work on contact lenses, the work must be done *slowly* and *carefully.* The doctor should do only half as much as he thinks necessary. as he can always do more if required.

Open Areas:

An open area is that part of a lens that does not rest on the sclera, but stands away from it. The technique we favor for closing it is as follows:

While the lens is on the patient, the open area is accurately marked. The lens is removed, and the markings are duplicated on the *inside* of the lens.

A small amount of impression stone is prepared and a stone cast of the inside of the lens is made. The lens should not be filled too full of stone, but just far enough to harden flat and even. When the cast is thoroughly set and dry, the patient's name, the date, and the exact counterpart of the red marks defining the area to be closed are marked with indelible pencil on the bottom of the cast. The lens is then separated from the cast. If the stone is completely set, the lens will come off with just fingernail pressure. The surplus red markings are wiped off the lens. On the stone cast, using a No. 2 black lead pencil, place a solid layer of black over the area to be worked, which will be indicated by faint red markings transferred from the lens to the stone. The layer of black lead pencil measures about .001 of an inch. With a sharp knife, this layer

of black is carefully and lightly scraped off, without taking off any more than necessary to remove the pencil marks. The cast is then lightly smoothed with No. 600 sandpaper. The amount removed from the stone cast represents the amount the doctor will have to "flow" the lens to close the area.

The lens is placed back on the stone cast, in the exact position in which it fits the cast perfectly. With the lens and cast held together firmly, a procedure similar to buffing is then performed. It is necessary to create a small amount of heat and pressure to bend the plastic. To do this, the buffing is accentuated by holding the lens against the wheel slightly longer than would normally be done. The proper timing is determined by practice and judgment. Without disturbing the grip on the lens and cast, this operation is then repeated on the polishing wheel. The lens is removed, the edge is inspected carefully to ascertain whether or not a sharp edge has been buffed onto it. If not, the patient is re-fitted. If the edge has been disturbed, it is treated as a slight contour problem and the corresponding adjustment is made. After re-fitting, if it is found to be necessary to close the lens further, *a new stone cast is made*, and the foregoing procedure is repeated until the adjustment is satisfactory.

Tight Areas:

Tight areas, as a general rule, are rare, mainly because only those evident in the primary position should be relieved. As stated above, any area that appears as a tight area in a rotated position is not to be considered for adjustment.

With the lens on the patient, the tight area that is to be relieved is marked with light strokes radiating outwards. The lens is removed and dried without losing the markings. The laboratory accessories include a small tapered, white felt "bob," mounted on a mandrel. This bob is placed in the adjustable chuck on the spindle of the motor. Buffing compound is applied. The entire area to be relieved is then shaded in on the lens with the red wax pencil, as illustrated in Figure 8.

FIG. 8

The lens is held in the same manner as though for inserting on the patient's eyes. With the wrist resting firmly on the work table in front of the motor, the lens is worked over the tip of the felt bob. It will be noticed that the point of contact of the bob in the inside of the lens can be seen clearly through the lens. This will show up as a dark spot that will travel back and forth as the lens is moved about. The entire marked area is covered by moving the dark spot around on it. This will remove quite a bit of the inside surface of the lens very quickly, and it is important to avoid exerting undue pressure, as only enough pressure to make the "spot" visible is required.

The doctor should not attempt to polish this area. The lens should be washed carefully and wiped dry with facial tissue. The patient is then re-fitted. If it is found that further relieving is required, the procedure can be repeated several times until the area is satisfacory. Here, as in the case of open areas, the doctor should do half as much as he thinks he needs at any one relieving operation. More can always be taken off, but it cannot be put back.

A creditable job of modifying and adjusting can be done by anyone who will follow carefully the procedure as described, and do a reasonable amount of practicing on some discarded lenses. The technique is both simple and very effective. The laboratory accessories required have been kept down to an unusually small amount. The actual work can be done in a matter of minutes and can be repeated several times during one visit of the patient.

VIII. CONCLUSION

The foregoing outline of the procedure used by the authors is not in any way intended to serve as a complete manual of contact lens practice. Its purpose is rather to point out wherein our concepts and techniques differ from those in use by others, and, therefore, presupposes either some acquaintance with contact lens practice, or access to a more comprehensive treatise, such as the admirable work of our British fellow Academy members, Dickinson and Hall*, just published in England, which we would recommend without reservations as indispensable reading for all those who are interested in contact lens work.

116 SO. MICHIGAN AVE.
CHICAGO 3, ILLINOIS

*An Introduction to the Prescribing and Fitting of Contact Lenses by Frank Dickinson, F.B.O.A. (Hons.), F.A.A.O. and K. Clifford Hall, F.S.M.C., F.A.A.O.—London, 1946. Hammond, Hammond and Company, Limited.

AMERICAN JOURNAL OF OPTOMETRY
and ARCHIVES *of*
AMERICAN ACADEMY OF OPTOMETRY

Established 1924

Vol. 24 MAY, 1947 No. 5

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Minneapolis 2, Minnesota

Annual Subscription, $5.00 in Advance; Canada, $5.50; Foreign, $6.00;
Single Copies, 50c.

Original papers, scientific communications, clinical reports, books for review, and correspondence should be sent to the editor. Subscriptions and applications for single copies should be addressed to the circulation manager. Copy of advertisements must be sent in by the first of the month preceding their appearance. Communications with reference to advertising or other journal business should be addressed to the advertising manager. Academy correspondence should be addressed to Dr. Carel C. Koch, Secretary of the American Academy of Optometry.

Published Monthly by the
AMERICAN JOURNAL OF OPTOMETRY PUBLISHING ASSOCIATION

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OFFICE AND LABORATORY RESEARCH CONTRIBUTING TO VISUAL SCIENCE

The entire question of research, or serious investigation on some predetermined subject is one which, at times, confuses optometrists. Many of our men feel that in spite of their deep interest in some particular phase of visual work, the mere fact that they are confined of necessity to their refracting rooms makes research work impossible. This is not entirely true.

It is, of course, a fact that certain forms of research cannot be done in an optometric office. Lack of competent assistants, inadequate space and the absence of laboratory equipment make certain research projects

the sole prerogative of our scientific research laboratories and our educational centers that are equipped to handle such matters.

On the other hand, many subjects lend themselves to the serious student who can profitably undertake an investigation within the confines of his office. This work, of course, requires a broad knowledge of the subject and a painstaking attention to detail to enable the optometrist to complete the study. In addition, it requires of the investigator a willingness to explore all phases of the question with an open mind, and above all it requires a sincere desire for the true facts—whatever these may be.

The Academy has for years encouraged research work. Some projects have been assisted by financial grants-in-aid. Most, however, have not been so assisted, but have been carried out by members who were sincere in their desire to improve a technique, to clarify some theory, or to develop some idea to further refractive science and improve optometric skill.

When completed, these individual research projects are usually presented by the author before the Academy at an annual meeting, or before some Chapter at a convenient periodic meeting. These technical papers are then published and become part of our literature.

A review of this journal for the year 1946 indicates that 15 of these original research studies were published. Of this number, seven studies were conducted by optometrists or research workers in the scientific laboratories of our institutions of learning or in similar quarters associated with ophthalmic manufacturing enterprises. The other eight were studies carried out by optometrists in their private offices. To illustrate this point a brief summary of these projects follows:

Neumueller[1] evaluates the findings of binocular refractive, phoria and duction tests, presenting a review of past correlations and the results of his own studies of this matter as Chief of Clinics at the Pennsylvania State College of Optometry. He refers to the original work done on the reciprocal relationship between accommodation and convergence as developed by Edwin Forbes Tait and presents a new near-point test card for phoria and fusional reserve measurements.

Alpern[2] reviews a study made to determine the effect of taking near

1. Julius F. Neumueller. The Correlation of Optometric Binocular Measurements for Refractive Diagnosis. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 6. 235-259.

2. Mathew Alpern. The After Effect of Lateral Duction Testing on Subsequent Phoria Measurements. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 10. 442-447.

point phoria tests immediately following the taking of distance duction tests. This, he points out, is a common practice among optometrists. The author reports that his experimental work with a group of cases indicates that this practice leads to a temporary increase in the esophoric finding at the near point, or a decrease in the near point exophoric finding. He suggests further study to determine the proper waiting period between duction and phoria findings.

Bannon[3] presents the techniques of near point astigmatic tests. He also presents data which clearly indicate the need for making near point as well as distance astigmatic tests. The findings of his studies in this field indicate the importance of independent measurement of astigmatism at the near point. Data are presented showing that of 50 reported eyes, 18 accepted a difference of ¼ D. between the distance and near astigmatic correction, while in seven eyes the difference was ½ D. His research, conducted at the Dartmouth Eye Institute, further indicated a change in axis between distance and near of at least 5° in 34 per cent of the cases reported upon.

A new "square-circle" visual acuity chart is presented by Shreve.[4] This chart is of particular value in determining the visual acuity of the pre-school patient.

Morgan[5] presents a new theory of accommodation. He pointed out that it is possible that the tension on the suspensory ligaments will increase and decrease depending on the mass and hence the blood volume of the ciliary body. Vascular changes, he points out, have an effect upon the sympathetic, and additional research work now being done at the School of Optometry, University of California will be reported by the author on this subject.

Fry and Alpern[6] report a study made to trace the implications of Jahn's modification of Hect's photochemical theory to explain the action of light on the retinal receptors. This research, conducted at the School of Optometry, Ohio State University, also touched on the subject of light and dark adaptation.

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3. Robert E. Bannon. A Study of Astigmatism at the Near Point with Special Reference to Astigmatic Accommodation. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 2. 53-72.

4. J. Robert Shreve. A Chart for Estimating Visual Acuity in Pre-School Children. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 7. 296-301.

5. Meredith W. Morgan. A New Theory for the Control of Accommodation. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 3. 99-110.

6. Glenn A. Fry and Mathew Alpern. Theoretical Implications of the Response of a Photoreceptor to a Flash of Light. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 12. 509-525.

Chodroff and Margaretten[7] present an original technique in orthoptics in which the peripheral visual field is stimulated by various patterns and designs composed of monochromatic green while the foveal attention of the patient is held fixed. This technique, accompanied by other standard forms of orthoptic training procedures has been found, by the authors, to be of value in improving the visual acuity of pseudo-myopes.

Walsh[8] presents a report on a clinical study of hyperphoria made of 2,200 refractive cases. Of these 165 cases or 7.5 per cent showed a hyperphoria of ½△ or more, and 58 cases or 2.6 per cent of the total were given vertical prisms in their ophthalmic corrections.

Hofstetter[9] studied 27 cases of squint and points out that the development of accommodative convergence is not dependent upon learning factors in the associated use of accommodation and convergence. Eberl,[10] in reviewing the report of Hofstetter fails to agree with his conclusions, however, and quotes Carr, Ling and Gesell to support her position that accommodative convergence relationships may be modified by training.

Braff[11] outlines in some detail the optical principles used in computing the curves for contact lens surfaces. Nupuf[12] discusses these aids to subnormal vision from the standpoint of the use of plastics rather than glass and presents the advantages of the plastic lenses. Roth[13] reviews some of the difficulties encountered in the proper selection of a contact lens solution, while Feinbloom[14] describes the Feincone contact lens and presents a review of clinical results of its use.

Ryer and Hotaling[15] present the methods used to sterilize instruments and head and chin rests in their New York City optometrical office. They suggest the use of ultra violet radiation for this purpose.

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7. Milton N. Chodroff and Elias J. Margaretten. The Effect of Peripheral Stimulation on Central Acuity. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 5. 206-209.

8. Rita Walsh. The Measurement and Correction of Hyperphorias in Refractive Cases. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 9. 373-391.

9. H. W. Hofstetter. Accommodative Convergence in Squinters. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 10. 417-437.

10. M. T. Eberl. Discussion of Hofstetter paper. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 10. 437-441.

11. Solon M. Braff. Optical Principles for Contact Lenses. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1926. 23. 6. 260-266.

12. J. S. Nupuf. The Physical and Chemical Properties of Plastic Contact Lenses. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1926. 23. 4. 152-154.

13. Robert J. Roth. The Isotonicity of Contact Lens Solution. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 5. 191-204.

14. William Feinbloom. Clinical Results with Feincone Contact Lenses. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 5. 210-215.

15. E. LeRoy Ryer and Elmer E. Hotaling. Notes on the Hygiene of the Refracting Room. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 2. 76-79.

Graham[16] reviews the subject of lens coating to remove reflections and ghost images and outlines the newest techniques of applying this film on ophthalmic lenses.

These individual studies covering, as they do, various phases of visual care, indicate without question the fact that competent and valued research work is being done by optometrists in their private practices as well as in our research laboratories. The technical contribution all of these men are making serves a most useful purpose to both the public and the profession and it further serves to stimulate others to work on the many visual problems which require further clarification.

CAREL C. KOCH

16. Robert C. Graham. Reduction of Reflections. Am. Jour. Optom. & Arch. Am. Acad. Optom. 1946. 23. 4. 145-151.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

NEW MEMBERS OF THE ACADEMY

The following optometrists have been elected to Fellowship in the American Academy of Optometry during the quarter ending March 31, 1947. The Executive Council welcomes these new members.

Dr. Charles J. Bertotto, 3819 No. Fifth St., Philadelphia, Pennsylvania.

Dr. Jacob Cohen, 1753 No. 33rd St., Philadelphia, Pennsylvania.

Dr. Gilda L. Coppola, 1302 Morris St., Philadelphia, Pennsylvania.

Dr. Robert LeGrand Dewey, 20 So. Front St., Philipsburg, Pennsylvania.

Dr. Irving P. Filderman, 711 Farnsworth Bldg., Memphis, Tennessee.

Dr. Luther A. Garns, 5433 Chester Ave., Philadelphia, Pennsylvania.

Dr. William M. Lyle, 283 Portage Ave., Winnipeg, Manitoba, Canada.

Dr. Edwin H. Manwiller, 5224 Spruce St., Philadelphia, Pennsylvania.

Dr. Russell S. Manwiller, 5224 Spruce St., Philadelphia, Pennsylvania.

Dr. Wm. J. McEvoy, 15 E. State St., Doylestown, Pennsylvania.

Dr. O. A. Schuessler, 826 Provident Bank Bldg., Cincinnati, Ohio.

Dr. S. Winfield Smith, 503 West 10th St., Wilmington, Delaware.

Dr. Frank W. Stever, 1109 West Main St., Norristown, Pennsylvania.

Dr. Fred W. Sutor, 12 So. 12th St., Room 1109, Philadelphia, Pennsylvania.

Dr. William O. Vivian, County Bldg., Media, Pennsylvania.
Dr. Alberto Zamora, 134 A. Bonifcaio St., Davao City, Philippines.

SCHEDULE GOVERNING ACADEMY MEMBERSHIP FEES

We sense, at times, in the secretary's office of the Academy, that new members are occasionally confused about the statements they receive when they join the Academy.

Because of this, we are including the following explanation: The by-laws of the Academy provide for an application fee of $5.00. This is paid by the applicant at the time his initial application is submitted.

If the applicant meets the requirements for membership as set forth in classifications 1-5, article 3, and sections 1-5 of article 4 of the by-laws (Pages 8, 9 and 10 of the Roster) he is then notified of acceptance. At this point, he is billed for his Academy certificate and annual dues.

The certificate fee is $5.00. The annual dues are $15.00. As the Academy is on a calendar year basis, dues are payable January 1. With the foregoing in mind the following schedule applies for new members:

Members who join during the first quarter of a year pay the full $15.00.

Members who join during the second quarter of a year pay $11.25.

Members who join during the third quarter of a year pay $7.50.

Members who join during the final quarter of a year pay only $3.75.

These dues payments are in addition to the $5.00 application fee and $5.00 certificate fee first mentioned.

LOCAL CHAPTER ACTIVITIES

VERMONT CHAPTER

Application to take in New Hampshire Fellows and change the name of their chapter to "Twin-State Chapter" has been received from the Vermont Chapter. This matter was discussed at the April meeting of the Vermont Chapter, and is on the agenda of the Executive Council for action while at Philadelphia.

New officers were also elected at the Vermont meeting: Dr. Laurence P. Folsom, South Royalton, president; Dr. E. Craig Wilson, Rutland, vice president; and Dr. Leland G. Chase, Springfield, secretary-treasurer. Dr. Gerald Preston, Burlington, was made program chairman, and Dr. Katherine Jordan, Brattleboro, elected to serve on the executive committee.

Dr. George Rand, Plymouth, New Hampshire, recounted to the group his experiences in optometric work in the Navy.

MICHIGAN CHAPTER

The Michigan Chapter of the Academy reports that their group has adopted the "Inspection Report and Questionnaire" designed by the Indiana Chapter to ascertain whether a prospective candidate for Fellowship has met requirements of the Academy in regard to ethical practice. This is a comprehensive four-page questionnaire which enables the Executive Council of a local chapter to screen an applicant quickly.

This chapter also reports that election of officers for the coming year took place at their annual spring meeting in April. The following officers were elected:

Dr. D. C. Thomson, Detroit, chairman; Dr. C. L. Grigware, Grand Rapids, vice-chairman, and Dr. G. D. Rowe, Dearborn, secretary-treasurer.

The all-day session started with committee reports and was followed by a Fellowship luncheon. In the afternoon, Dr. Eugene Freeman, Chicago, presented a paper on contact lenses, and Dr. John E. Wright, Detroit, followed with a paper entitled, "The Versatility of the Cheiroscope in Diagnosis and Training." Dr. Wright concluded his paper with a demonstration of the tachistoscope and led a discussion of visual training programs and methods.

REPORT OF ACADEMY MEETING IN JUNE ISSUE

By the time the Journal is delivered this month, the annual convention at Philadelphia will be over and another technical program ready to go into the literature of optometry. The papers presented at the meeting will, as usual, be printed in the Journal starting in June, as will committee reports and other accomplishments of the Academy at the convention.

PUBLISHERS NOTICE—Notice of change of address of your AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY should be received in the offices of the American Journal of Optometry Publishing Association by the first of the month to affect the following month's issue. Be sure to include your postal zone number.

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

REALISTIC DRIVERS' TESTS

A note of realism has been injected into some of the driver tests originated by the Traffic Engineering and Safety Department of the American Automobile Association.

In their distance judgment test, for example, miniature automobiles are substituted for the rods usually used for depth perception tests. In this test, the ability to judge distance is measured by lining up two movable miniature automobiles with a fixed car in the center. By means of a mirror placed at 10 feet an apparent distance of 20 feet is obtained.

This is only one of the instruments described in the bulletin, "Driver Testing and Training Devices," published by the AAA.

For the glare acuity test, persons being tested are kept in complete darkness 30 minutes prior to testing. This dark-adapting practice is of value in determining the patient's ability to see detail at night when illumination is at a low level.

A special perimeter for testing only the horizontal fields of vision is reviewed. In this new instrument, vertical test objects pop up just like pedestrians into the peripheral field while the subject fixes a central object.

This brochure also describes an eye dominance testing instrument as well as equipment for registering reaction times, steadiness and ability to operate certain mechanical equipment on an automobile.

Credit for much of the work done in this field belongs to Dr. Earl Allgaier, research engineer for the AAA. Dr. Allgaier, who is well known to Journal readers through his early writings on the subject of visual tests for automobile drivers, has coordinated much of the research work done on visual problems of these drivers.

Further information on the instruments described in this bulletin may be obtained by writing Dr. Allgaier. AAA headquarters are at Pennsylvania Avenue at 17th Street, Washington, D. C.

DEADLINES

"We regret your announcement did not reach us in time" is not

the way the Journal likes to begin letters to contributors to this department, but each month we find it necessary to send a few such letters.

As omission of news is a loss to our readers, we suggest contributors observe the following "deadline" rule:

Announcements for "Current Comments" involving a specific date must reach the Journal office at least two months prior to the date of the event. For example, if a meeting is scheduled for July 30, copy should reach us by May 30. The announcement would then appear in our June issue which reaches subscribers around June 21, thus giving the reader plenty of time to make plans to attend the meeting if he is interested.

Of course, if no time element is involved, the above deadline rule need not be observed. In this case, copy should reach us by the 25th of the month preceding the month the news is to appear. For example, copy for the July issue should be in the Journal office by June 25.

If the news covers an event which has already taken place the Journal would appreciate being notified at the earliest possible moment.

SPEAKERS AT THE AOA CONVENTION

Plans for the American Optometric Association convention at the Hotel Chelsea, Atlantic City, June 22-25, are moving into the final stages, convention headquarters report.

Three educational sessions, punctuated by entertainment and business meetings are on the program. These educational sessions are scheduled for Sunday afternoon, June 22, and the afternoons of June 23 and 24.

Among the subjects to be discussed will be: retinoscopy by Dr. James H. Grout; contact lenses by Drs. John G. Neill, Jacob Nevyas, Fred W. Sinn, and G. A. MacElree; optometric jurisprudence by Dr. Irving P. Filderman; multi-focal lens problems by Dr. Fostor Namias; visual acuity by Dr. Glenn A. Fry; color vision by Dr. G. L. Walls.

Fundus pathology by Dr. F. M. Whitsell; applied neurology by Dr. O. G. Rybachok; screening devices in occupational vision by Allen C. Holland, Marguerite Thoma Eberl and Edwin H. Silver; projection kaleidoscope in visual training by Dr. Harold Haynes.

General pathology by Dr. H. G. Noyes; neural anatomy in visual fields by Dr. Harold Simmerman; clinical optometric research by Dr. Carl F. Shepard.

Abnormal psychology by Dr. Louis Wekstein; image formation

in the eye by Dr. E. W. Bechtold, and extra-ocular muscle disfunction by Dr. J. D. Kratz.

The convention officers for this Golden Jubilee Congress are Dr. George L. Brown, general chairman, Paulsboro, New Jersey; Dr. Andrew F. Fischer, vice-chairman, Trenton, New Jersey, and Dr. Earl Ridgeway, secretary-treasurer, Trenton.

RECEPTION ROOM BOOKLET

Reminiscent of "Teddy" Roosevelt's boyhood is the American Optical Company's 16-page book, "What Price A Boy's Vision?" just off the press.

History tells us that as a boy, Roosevelt loved to hunt, but found at an early age he could not see the quarry because of poor vision.

So it is with young Bill Cody, the hero of AO Company's story. While at a boy's camp, Bill finds he is poor at sports, and not knowing the reason, asks his dad to take him home. Puzzled, his father consults the camp director, who tells him he thinks Bill needs the services of an eye specialist.

Both the camp director and the doctor eventually consulted have to persuade Bill's father that the problem is not one of "buying glasses."

Cleverly, and clearly, the story points out to the reader (in this case, the patients in your waiting room) the advantages of professional eye care.

"What Price a Boy's Vision?" is a strikingly illustrated, attractively bound (blue board cover) book of considerable value to optometrists.

BOOK NOTICES

THE USE OF DRUGS IN REFRACTION. D. W. A. Mitchell, F.B.O.A., Hons. Published by the Hatton Press, Ltd., 72-78 Fleet Street, London, E. C. 4., England, 96 pages. Illustrated. Cloth. 1946.

This text covering the use of cycloplegics and mydriatics for optometrists was bound to come sometime. Before going further, let the reviewer say that this is a British book—written and published for British optometrists who normally, though infrequently, use cycloplegics in their routine refractive work.

In many respects the ophthalmic optician of England is quite like

his counterpart, the optometrist of Canada and the States, with this one minor difference—in England optometrists as a group never have taken the flat-footed stand that "drops" were wholely unnecessary in refractive work as have practitioners over here. As a consequence the optometrists of England use cycloplegics whenever they wish. True, they use them but little, as the English public has the same resentment toward their use as has the American public, but now and then, in certain cases, the English optometrist makes a cycloplegic refraction, followed as always by a non-cycloplegic one.

To serve this small need Mitchell compiled this text. The author is on the staff of the London Refraction Hospital and is also a member of the Pharmaceutical Society.

Mitchell reviews some of the physiology of vision and outlines the part certain drugs play in making a refraction and internal examination of the eye. The author then describes the various drugs used as well as the proper manner of instilling these and the precautions to be taken by the optometrist in their use. The text ends with a section on prescription writing.

As long as most optometrists in America continue their somewhat dogmatic stand against the use of cycloplegics, this book will only be of academic interest to them. CAREL C. KOCH

CLINICAL ORTHOPTICS. H. W. Gibson, F.B.O.A., F.S.M.C. Published by the Hatton Press, Ltd., 72-78 Fleet Street, London, E.C. 4., England. 247 pages. Illustrated. Cloth. 1946.

The author is senior orthoptist at the London Refraction Hospital. This book is the text used by students at the hospital in their class work and for clinical instruction in orthoptics. The subject itself is presented in 200 pages. The author then supplies a glossary, nine case histories and a bibliography.

Gibson treats the subject in a sound, conservative manner. He finds the treatment of squint to be the basis for orthoptic work, but properly differentiates between the techniques used in squint cases and those used in the heterophorias. His concepts follow the modern trend in regarding orthoptic training as an aid in the restoration of the function of binocular vision.

Naturally a considerable portion of the text is given over to British equipment used in this work. Many of the instruments mentioned are not widely used in America but their counterparts are here and can be readily identified.

This is a British text book. The author quotes English and continental writers who specialize in this work. He fails, however, to include the recent studies on accommodative-convergence relationships from the schools of optometry at the University of California and the Ohio State University, as well as other findings on this subject from outstanding American orthoptists. CAREL C. KOCH

ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

1. OCULAR REFRACTION

THE MEANING OF CLINICAL TESTS IN THE LIGHT OF LABORATORY MEASUREMENTS. Meredith W. Morgan. The Indiana Optometrist. 1947. 19. 2. 6-10.

Morgan discusses the difficulties encountered in controlling clinical findings and compares these the more precise findings of the laboratory where the selected subjects are trained by a repetition of tests and where their responses are naturally more rapid and accurate than are those of clinical patients who are naturally unfamiliar with the same tests. It is at this point, the author points out, that clinical science leaves off and the art of optometry begins. Morgan compares the clinical and laboratory findings of accommodative-convergence tests and establishes limits within the range of which clinical findings may be accepted. C.C.K.

REPORT ON SURVEY OF OPTICAL AIDS FOR SUBNORMAL VISION. V. J. Ellerbrock. The Journal of the Optical Society of America. 1946. 36. 12. 679-695.

This paper deals with devices used to aid vision for that group of patients who, when fully corrected, have total vision between 20/70 and 20/200.

The author reviews the historical background of telescopic spectacles, pinhole, tubular and slit spectacles, shields, magnifying lenses,

magnifying contact lenses and projection systems which are now in use as aids to subnormal vision.

He next presents a clinical evaluation of these aids, pointing out at the same time the difficulties encountered in getting the patient to adjust himself to the greatly changed visual habits which these aids require.

In general, Ellerbrock finds the aids mentioned fairly efficient, each giving some assistance to certain types of subnormal vision problem cases. This is true in great part, however, only when these are prescribed at the hands of a trained refractionist who will take the time and effort required to train the patient in the use of the proper aid selected for him.

This is a condensation of a report submitted to the Committee on Sensory Aids of the [U.S.] Office of Scientific Research and Development. The author supplies a very complete bibliography. C.C.K.

TRIFOCALS—A BRIEF FOR UNIVERSAL ACCEPTANCE. Ernest A. Hutchinson. The Optical Journal and Review of Optometry. 1946. 83. 22. 31-32.

Hutchinson reviews the focal range difficulties encountered by presbyopes who wear bifocals with reading additions of +2.D or greater. He suggests a reduced Snellen chart for use at the reading distance and also the intermediate distance. His paper stresses the need for proper lens positioning when fitting trifocals and advocates the use of these lenses as standard equipment for all middle age and older presbyopes. A.V.H.

SELECTION OF CONTACT LENS PATIENTS. B. Spiegel. The Journal of the New York State Optometric Association. 1947. 14. 5. 2-8.

According to Spiegel, patients who are extremely nervous or who have a history of glaucoma, retinal detachment or severe lid involvements should not be fitted with contact lenses.

The author recommends as good contact lens patients those with a strong motivation to wear them, such as patients with a keratoconus, corneal scars, irregular astigmatism, high myopia and regular astigmatism, aphakia and that larger group with average amounts of ametropia who for one reason or another wish to use contact lenses and thus eliminate glasses for at least part of the time.

The author does not advise the use of contact lenses in the average presbyopic case or for children under 12 years of age. A.V.H.

DISSATISFIED PATIENTS. M. Cholerton. The Optician. (London). 1947. 113.2916.34-36.

Cholerton reviews the entire subject of failure on the part of an optometrist to satisfy a patient. He finds failure falling into three categories: (1) Those due to errors of judgment on the part of the optometrist. (2) Faulty frame fitting, and (3) the disposition of the patient.

The normal optometric tendency is, of course, to put all failures into the third category, yet the author finds that only a part of them properly belong there. He points out that many failures of judgment arise from (a) an insufficient or misplaced evaluation of the source of the symptoms or nature of the disorder; (b) over-emphasis upon irrelevant factors to the exclusion of those more directly implicated; (c) points which elude observation; (d) unnecessary prescribing; (e) insufficient regard for the intrusion of disturbing factors arising out of, or peculiar to the composition of the prescription, and (f) insufficiently balanced corrections.

As far as frame fitting is concerned, many failures too, result from carelessness. He points out that otherwise good prescriptions have been spoiled by lack of attention in this direction.

As far as the disposition of the patient is concerned it is true that there are a few patients who believe "a thing is never right until it is wrong first" but Cholerton finds these in the minority and that additional kindness and care will usually win them over to the side of the optometrist. A.V.H.

SCREENING VISUAL DEFECTS IN SCHOOL CHILDREN. L. N. Myer. The Optometric Weekly. 1946. 37. 40. 1377-1378.

The author mentions a number of recent visual surveys which have been made in schools. He then reviews the survey first made at Oak, Massachusetts, and presents the survey technique known as the Massachusetts Vision Test. This test was originated by Dr. W. B. Lancaster while head of the Dartmouth Eye Institute. The test is devised for use by teachers and uses Snellen's test symbols at 20 feet for checking visual acuity at a distance with the patient uncorrected, and again checks visual acuity after the introduction of plus spherical lenses. The test also provides a distance and near point phoria test for checking vertical and lateral muscular imbalance.

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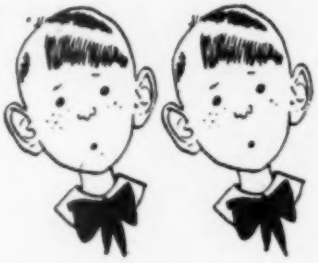

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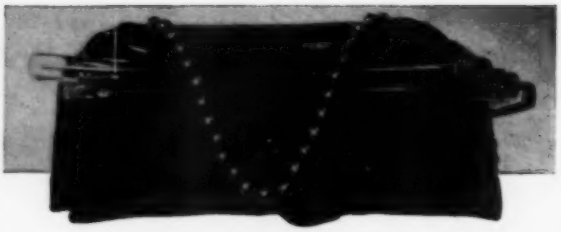

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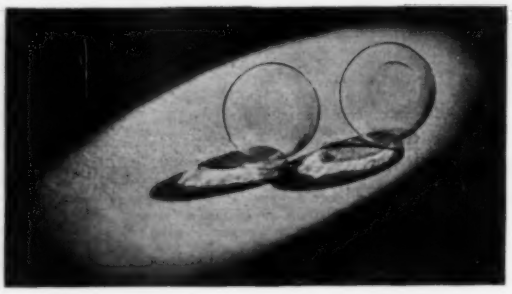

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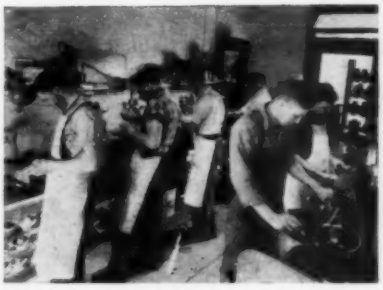

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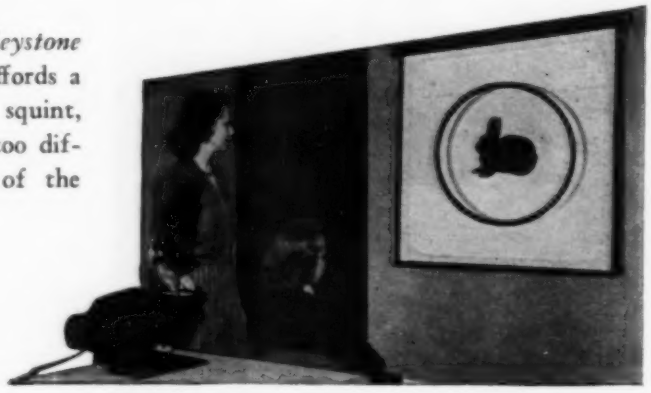

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